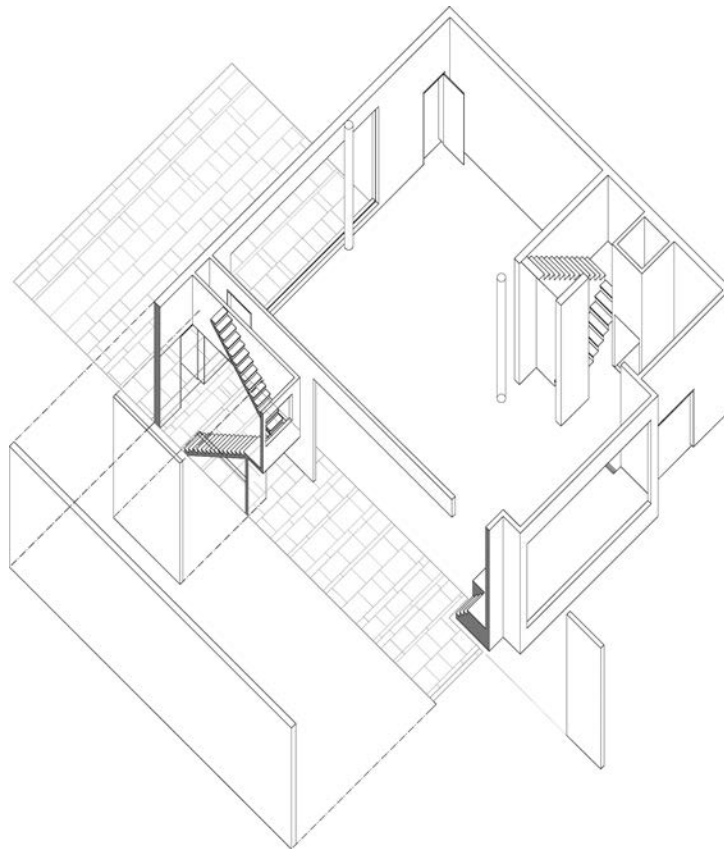


# ARCHITECTURAL DRAWING

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SECOND EDITION





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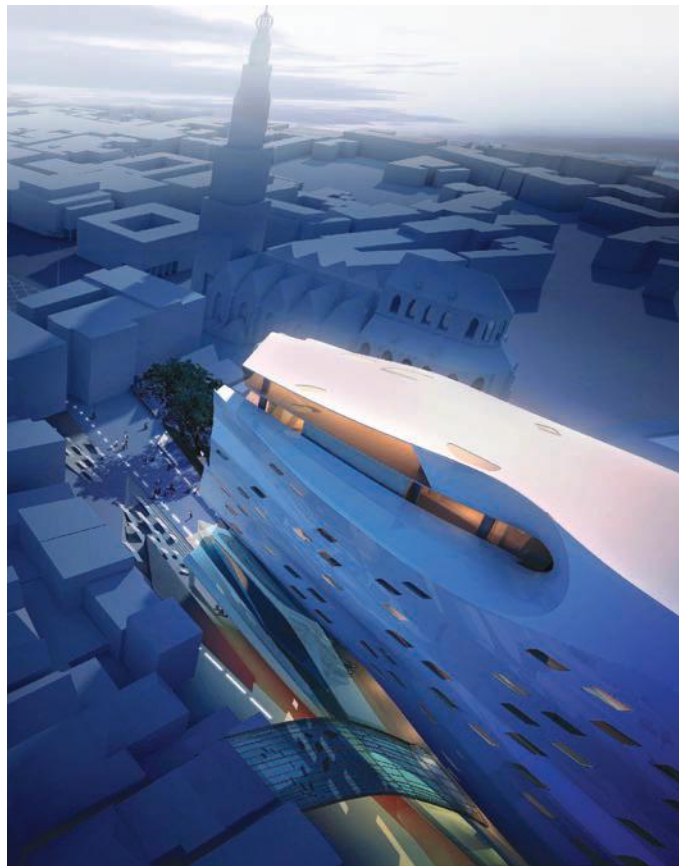
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DAVID DERNIE

# ARCHITECTURAL DRAWING

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SECOND EDITION



Laurence King Publishing

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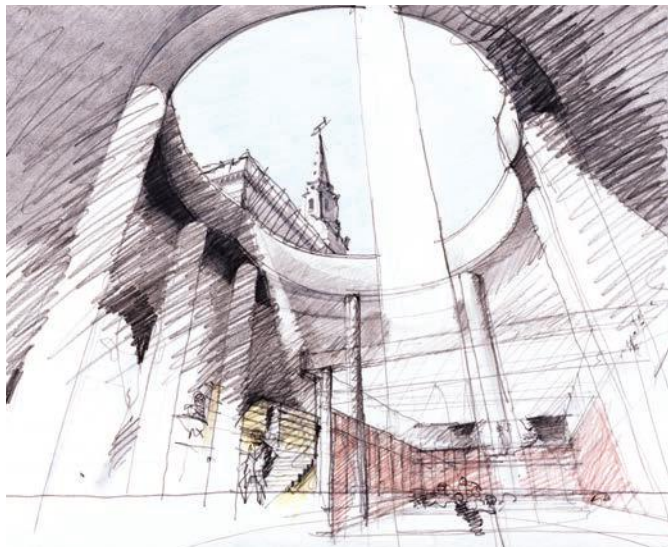
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# Introduction

‘What I believe is that whether it be a question of sculpture or of painting, it is in fact only drawing that counts. One must cling solely, exclusively to drawing. If one could master drawing, all the rest would be possible.’ **Alberto Giacometti**

This book celebrates the wide range of drawing techniques now available to architects. It looks at conventional and less conventional drawings and the methods used to make them in an attempt to open up creative approaches to architectural visualization. At a time when buildings and components can be wholly manufactured digitally, this book attempts to readdress the whole question of drawing as a way of thinking, a notion that is common in other visual arts. Drawings are extraordinary concentrations of visual and creative experience, synthesized through the disciplined mastery of both traditional and digital techniques. They

## **Below**

Charcoal and pigment sketch on canvas, by David Dernie.



represent a tradition of visual expression, where the reciprocity between thought and material is laid bare, as Yves Bonnefoy expresses: 'I have always understood drawing to be the materialization of the continually mutable process, the movements, rhythms, and partially comprehended ruminations of the mind.'<sup>1</sup>

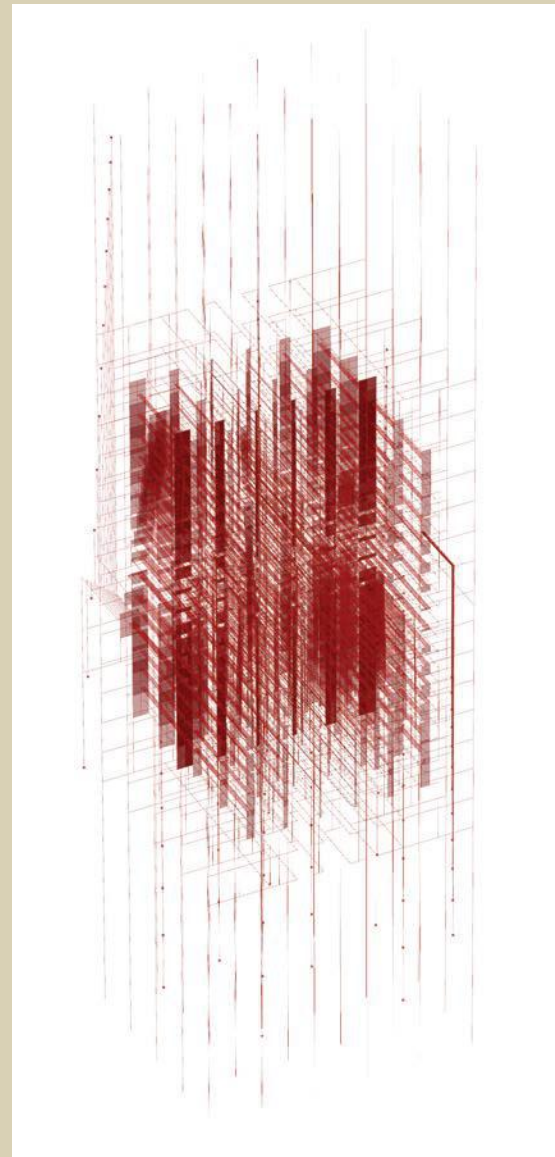
In recent years interest in architectural drawing has re-emerged as an ever more complex theoretical discourse has floundered. Architectural drawing processes are now acknowledged as key to experimentation and the creative development of a discipline that has absorbed a radical digital revolution over the past two decades. There is a new realization of the potential of architectural drawing today, as rooted in the ancient tradition of *disegno*, which means 'drawing and design', a way of thinking that belongs to human experience.

## Digital and Analogue

Across the visual arts, drawing and 'mark making' are recognized in terms of the expression and spontaneity of creative thinking, but it is not surprising – given the nature of architecture – that until recently the immediacy of handmade drawing had been all but replaced by the 'plotted', or indeed 'calculated' image, while the physical 'act of drawing' had been reduced to a mediation with a screen and its peripherals. But in this so-called 'age of digital building', it is timely to recognize and explore the interdependence of analogue and digital in architectural representation.

Digital media now offers unprecedented opportunities for architectural drawing and has adapted to a modern construction industry that has, on the whole, moved away from traditional crafts. In so doing, drawings have necessarily become dimensionally more precise. Where once artisanal experience and craft tradition would underpin the translation of a hand drawing into carefully crafted building elements, digital drawings now determine every detail of production, with little room for creative development during manufacture or construction. Input at full scale, digital drawings can describe a whole building in precise detail like never before. The new medium not only offers a liberation to imagine new forms, but also the means to deliver complex forms on site, by 'cascading' precise information to fabricators and constructors.

At the same time, however, architectural drawing is broader than just digital drawing, and there is an important dialogue to be maintained with other kinds of drawings and techniques that may reflect different kinds of architecture, imaginations and design processes. This book is intended to inspire as well as to instruct, exploring a diverse range of drawing types that emphasize drawings as vehicles for 'thinking about' rather than simply 'illustrating' architecture. Using examples from fine art, photography and stage design, the text explores the interdisciplinary nature of



### Above

Digital study by Yakim Milev for the refurbishment of Centre Point, London.



modern drawing, its integration with digital making, and the role the act of drawing can play in the exploration of the spatial and material conditions of a situated event.

The approach here is to demonstrate the complementary relationship between traditional techniques and computer-generated images. After decades of ubiquitous digital renderings, we now see more diverse drawings emerging and the value of architectural drawing is up for review. Long sidelined in favour of digital drawings, the creative potential of analogue, mixed-media and composite techniques is increasingly recognized as a vital means to synthesize new ideas and understand ever more complex environments. Drawing is an individual expression, and digital media combined with analogue techniques, or 'hybrid' drawing, makes for more diversity of interpretation and allows us to explore the 'drawing as artefact'. Drawings are the first steps in the process of making, and combining hand and digital drawings will contribute to the synthesis of craft with digital fabrications: three-dimensional or 'constructed' drawings – which are part drawing, part model – can bridge to ideas about making buildings.

## Drawing and Thinking

At all stages of the architectural design process, drawing reflects 'how we think' about a project. The techniques we use and the kind of drawings we make speak of the character of our ideas and approach to the brief and its context, and they will change through the design process. For instance, the ways in which we make drawings to explore strategic themes, site and context will necessarily be different to techniques we use to communicate details of the project to, say, contractors. The challenge is to use appropriate techniques at each stage of the project, which engage with individual design directions, and also to make the right types of drawings, which take intentions forward and communicate them clearly. Drawings are the fundamental drivers through the course of a project that help us to think from inception to technical resolution.

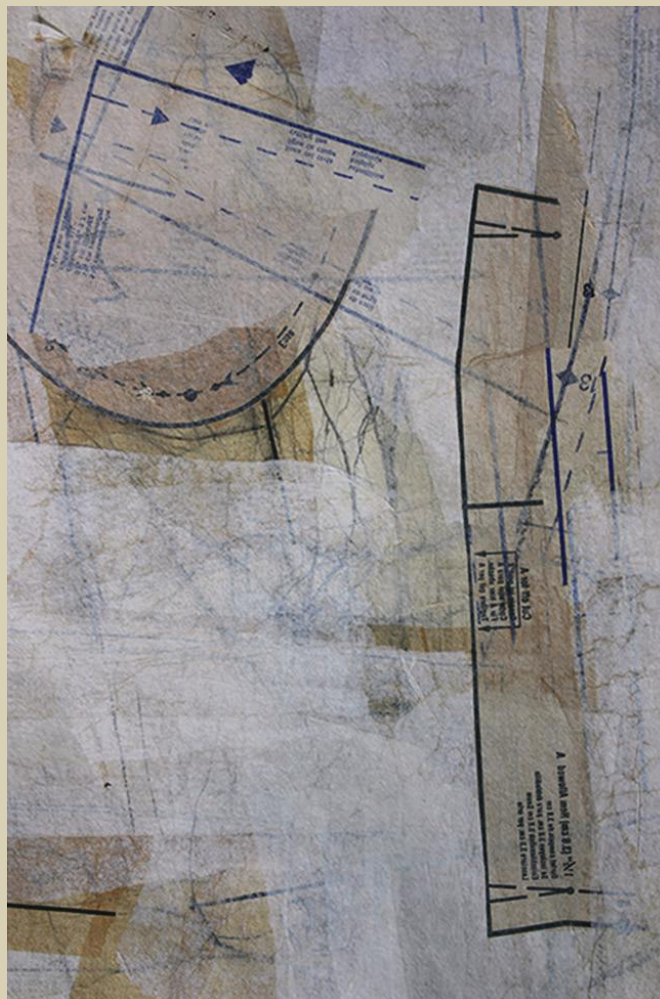
Any one drawing inevitably only deals with a part of a project, or idea. Although buildings can sometimes be captured by a single iconic sketch, architectural experience is complex and drawings need to be 'read into': compare, for instance, a street plan or section with the experience of street life. The street plan is only an approximation of the richness of the life of the street. When we read such a drawing, we bring our understanding of what a street is to bear on our interpretation of the plan: our engagement with

the drawing is personal. In this way drawings act as vehicles for thought, as touchstones for imagining the real places that they partially describe or allude to. No matter how detailed the drawing, we will each interpret it as individuals, building an imaginary picture of the place it describes from our own experience of the spaces or materials illustrated. It is not surprising that in the end the built work is always a revelation, as multi-sensorial experience of architectural spaces cannot be fully described by drawings. Drawings are like bridges for our imaginations, leading us towards the building's final material resolution.

Traditional drawing types and the craft-based design process evolved together, so that stages of the design process would be structured by certain packages of drawings at different scales. Today, however, the multidisciplinary basis for building production has meant that information tends to be packaged in a different way – and increasingly through an integrated digital model from the outset. So-called Building Information Modelling (BIM) integrates drawings into a coordinated three-dimensional model that can be analyzed and used to digitally fabricate and eventually construct buildings. Software permitting, this model is shared

### Right

Thinking through a site strategy  
with pencil, paper and glue;  
drawing by David Dernie.



between consultants so that each can make their specialized contribution, and it can be interrogated to give a measure of building performance. Two-dimensional drawings can be taken from the model as necessary, but the model is key in buildings that are procured through BIM. In this design and construction process, the 'model manager' replaces the drafting team as the hub of information management. BIM represents a radical change in the way it facilitates three-dimensional drawing information to be shared between multidisciplinary teams, potentially in different parts of the world, and then disseminated through the industry to eventual building construction. The efficiencies of the BIM process and future opportunities it offers for resource management are clear. What is less clear is how we maintain the connection with creative design ideas and other forms of intelligence through different ways of drawing, how we maintain a role for experimentation, for analogue and digital drawing in this wholly digital procurement process.

While the integrated digital model facilitates team working, information is input as real dimensions; as a result, it necessarily changes the way we think about a project. In particular, it changes the way we think about scale. Traditionally, it was commonplace to think about a project, from the scale of the context or site to material detail, through intermediate general-arrangement drawings, used to coordinate the drawing set. A section of, say, a room at 1:20 was not a large version of the same section at 1:100. Rather, the 1:20 drawing reflected thinking at that scale. It would include details that may not have been known when the project development was only at 1:100. In this tradition, the sequence of drawings from rough sketches to material details represented a way of thinking that was sequential in

terms of scale and incrementally more dimensionally precise. That is to say that the process of drawing at different scales reflected different scales of thinking. Traditionally, scale rules and templates would allow the architect to sketch out to scale, and he or she would become accustomed to reading drawings to scale and to thinking about spatial arrangements with a keen understanding of measure in relationship to the human body.

To some extent the computer can be used to simulate this process of 'scale drawing', but drafting software tends to require full-scale dimensions from the outset. So the training of the eye and imagination to read drawings at different scales is diminished if we use digital drawing alone for all work stages. We return to the importance of keeping alive a variety of techniques, both analogue and digital. By working between the two, we can ground architectural training on an understanding of both the discipline of hand drawing and also the potential of new media. We should remember that neither a pencil nor a computer can teach us to draw; but drawing will emerge from our ideas, and its quality will rest on our experience of appropriate techniques for their expression.

### Generative, Analytical and Illustrative Drawings

Drawings often contain composite information, or serve a number of purposes, but it is nevertheless useful to differentiate between generative drawings (developmental drawings that generate ideas), analytical drawings (which articulate an aspect of a project or observation) and illustrative drawings (which describe what a place looks like).

Generative drawings reveal ideas. Working on such a drawing is a process of discovery, a characteristic that John Berger describes as the linchpin of what it means to draw:



**Above**

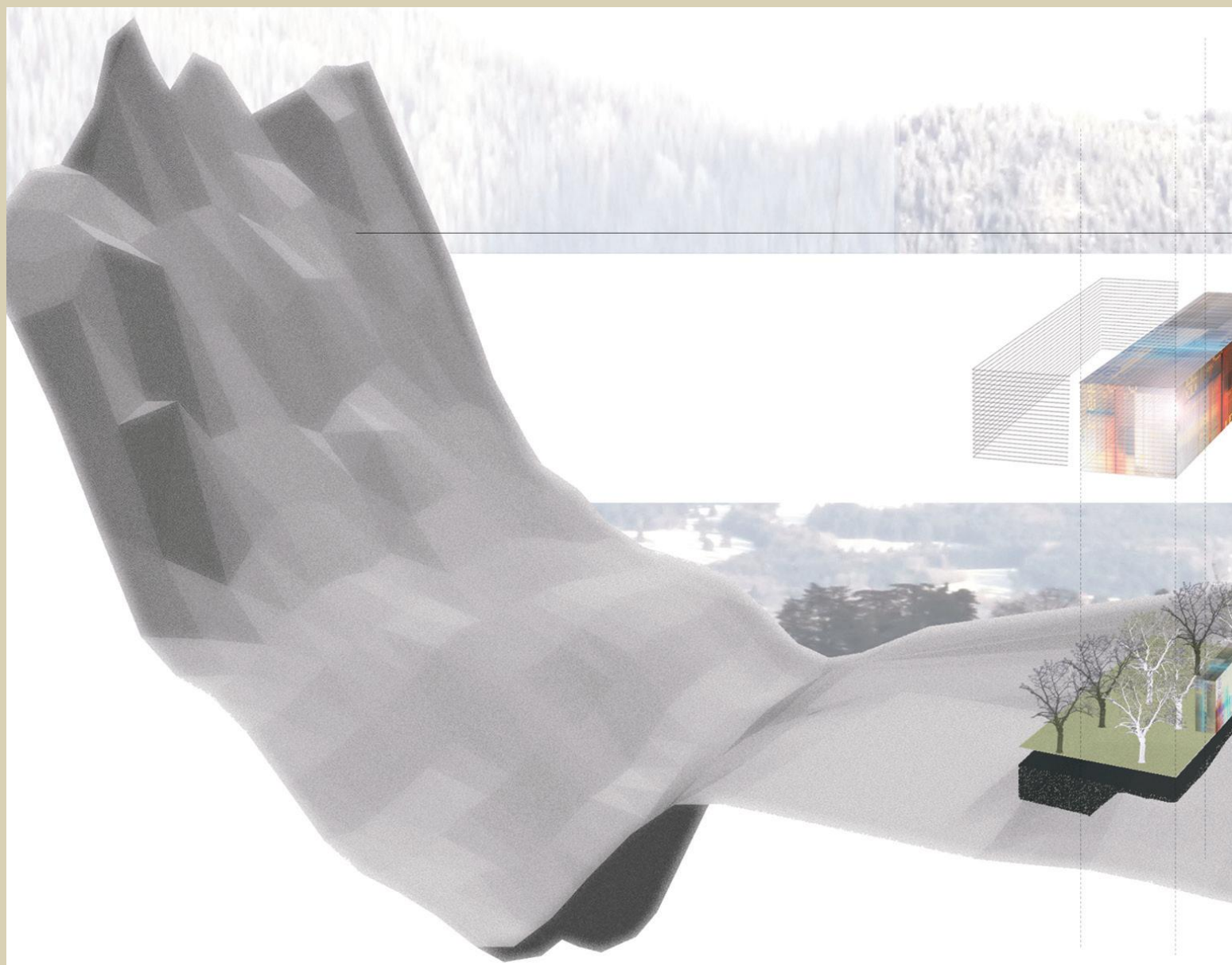
Generative forms for museum interior, by David Dernie.

'nearly every artist can draw when he has made a discovery. But to draw in order to discover – that is the godlike process, that is to find effect and cause.'<sup>12</sup> As Berger indicates, these kinds of drawings are often the most difficult as they are open-ended, but they help us to find individual approaches to design and material, using the process of drawing as visual research. Driven as much by the process of drafting as it is by programme, context or explicit ideas, the drawing is allowed to arrive at its own conclusion, for drawings-as-visual research have the ability to suddenly reveal new ideas. At a certain point of the visual process of drawing, there is a leap: something just happens to be right. Such instinctive knowledge, what we might call 'visual intelligence', is a fundamental part of the human content of drawing and individual creativity.

Analytical drawings, on the other hand, depict a project through a particular lens that brings a singular or small

**Below**

Analytical drawing illustrating relationships between built and natural forms, by Michael Brookman-Amissah with Tuke Manton Architects for a competition for the World Trade Organization, Geneva.

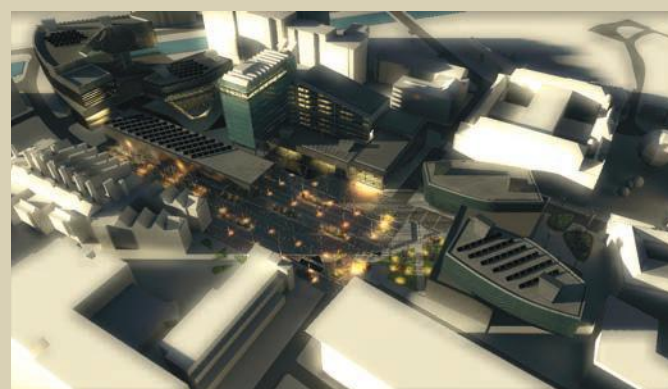




number of aspects of that project into focus. Analytical drawings may follow conventions, such as the use of plans and sections, or be developed as new forms of drawing or diagrams. Diagrams can helpfully reduce complex design problems to their constituent parts, and be used together with other drawings on the journey towards a synthetic design solution. As analytical tools, conventional architectural drawings convey information but fall short of representing architectural experience because our perception of a place is only partially composed of visual data.

Illustrative drawings present a design or an idea that is already largely defined. As illustrations, they convey information and range from perspectives to details, from sketches to presentation drawings. Techniques for illustration drawings vary widely. Rendered views, for instance, often use a range of software that first create the three-dimensional

model, then extract the view, texture map surfaces, simulate natural or artificial lighting and finally 'inhabit' the space. Near photorealistic images have become the norm, and while they can impress at the level of detail and resolution, they are often less compelling than the image that plays down some of the 'effects' in order to convey the essential character of the proposal more effectively. Full-blown renderings, with their evenness and accent on drama and 'atmosphere', can have less impact than drawings that are more selective in what they show, partly because of the predictability of the visual effects that some software produces, and partly because any one illustration cannot show everything well. As a rule of thumb, an architectural drawing can show only a few things effectively – as few as three. For instance, a drawing of a room that is about light, colour and material should focus only on doing that well.



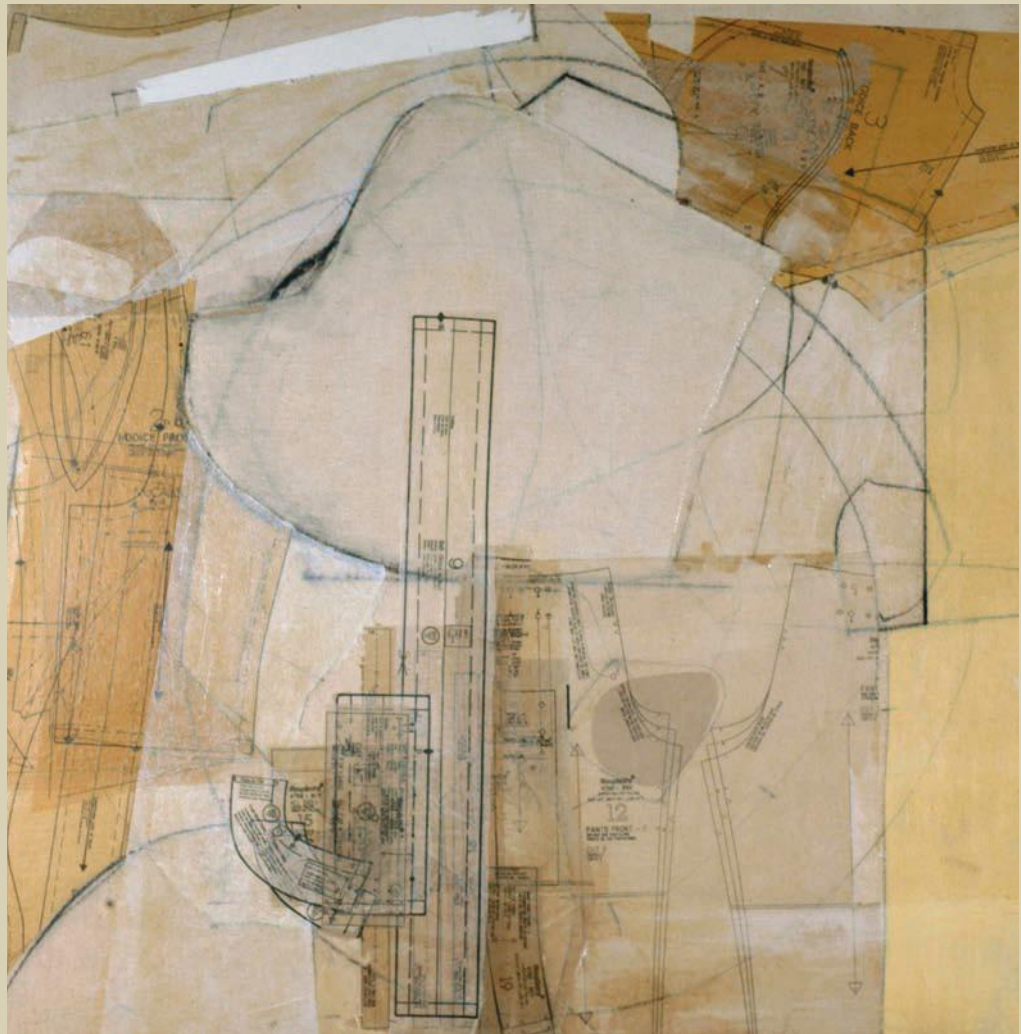
#### Top

A rendered aerial view of a digital model clearly illustrates an urban layout, by Michael Brookman-Amissah.

#### Above

Devanthery & Lamunière, School of Life Sciences, Lausanne,

Switzerland, 2005. This digital render drawing shows the glass entry wall of the building, which opens up the world of research and scientific information to the city. The night scene and transparent foreground figures emphasize the life within the three-storey reception space.



**Right and opposite**

*Imaginary Cities 1 and 2,*  
by David Dernie.

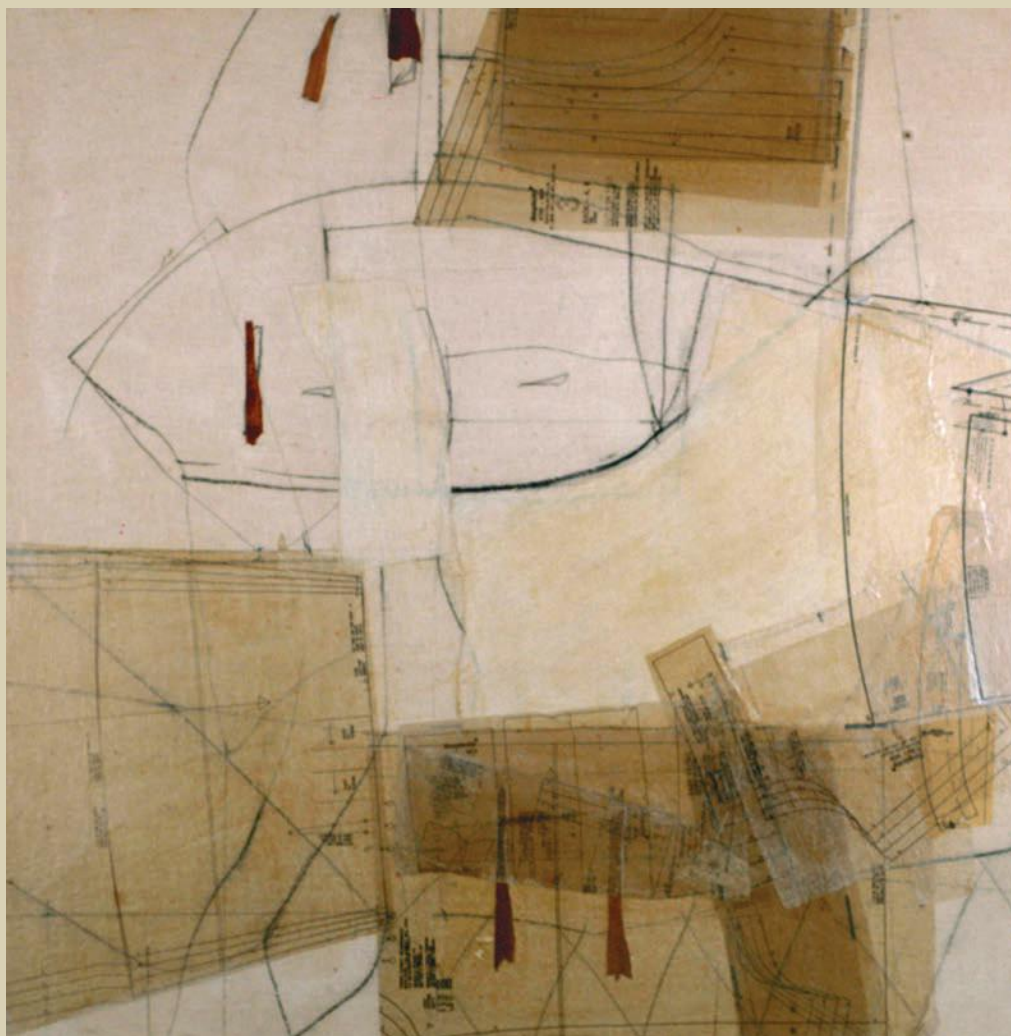
The same drawing should not illustrate, say, the construction or day-to-day life of the room. Illustrations should be less holistic than analytical: they should convey a particular part of the narrative, leaving the whole story to be completed with reference to other kinds of drawings.

Drawings work with reference to each other, and any combination of these three kinds of drawings will help to order ideas through the design process. At the start of a project, when themes and approaches are varied, it is especially important to keep a variety of drawing types in dialogue with other forms of representation like sketch models and other artefacts, video and photographic work. At its heart, architectural design is about synthesis: a bringing together of ideas into coherent spatial relationships. Working fluidly with different two- and three-dimensional approaches during the early stages of the design process will facilitate the development of a rich project. A great building is never the result of one single idea, nor is it the straightforward sum of many. However, the first step to a great building is interpretative drawing, which offers a path towards maintaining genuine creativity in the discipline. As the

project develops it will inevitably require focus on drawings that provide clarity, and increasing detail and dimensional precision. At the same time, even at this stage of the project, sketching and other kinds of interpretative studies can help resolve questions of material and constructional detail, as they help us to see the consequence of full-scale detail decisions in the context of the whole project.

A working method that combines analogue and digital, real and virtual models suggests a hybrid workplace that is neither the CAD office nor the artist's studio. Rather the architect's workspace needs to combine a high-resolution screen (or screens), a touch-sensitive drawing tablet, a drawing surface, parallel motion and a place to model. It may be near to a place to scan, photograph and print onto a range of papers. As drawings shift between two and three dimensions, the architect's workspace may also need access to a 3D printer or a laser cutter. This kind of drawing workshop of the future, which contrasts with most contemporary office environments, will facilitate the combination of analogue and digital drawing and contribute to the diversity of ideas that underpin creative architectural production.





## Material Drawings

This approach to drawings and workspace makes a connection with materials from an early stage. Combining the digital with non-screen hand drawings as an integral part of the design process helps us to explore the materiality behind our ideas. The variety of papers, drawing media and instruments brings a sense of materials into the way we work through ideas, and into the practice of architectural design. Software that simulates drawing surfaces, material effects and drawing instruments may be visually effective, but it remains detached from the materials themselves. This disengagement of visual form and materiality, which may be a product of the digital drawing process, arguably finds its built corollary in the wallpaper-like patterned skins of contemporary buildings. By repositioning the act of making drawings in the context of materials, and using materials to make two- and three-dimensional drawings, we are strengthening the ancient connection between materials and drawing, and between materials and architectural design.

The intrinsic relationship between drawings and matter stretches as far back as culture itself. Drawings existed, often

in exquisite form, in the earliest kinds of space. Scratched deep into the rock or held aloft towards the gods, the visual language of early drawing was a means to articulate the world (see, for example, the earliest such drawings made around 30,000 years ago in the Chauvet Caves, above the Ardèche River in France). We know that such drawings appear to be orchestrated with the forms of the caves' limestone walls, as a series of clustered arrangements. With no sense of these drawings as independent 'aesthetic objects', their meaning was intimately bound to the rock, the underworld, time, underground movements, animated beasts and analogical relationships with the world and stars to which they connected. The limestone rocks – the living rocks of the caves – were integral to the drawings and the experience of them, such that one could say that these drawings were not *on* the cave walls but *of* the cave.

While we do not fully comprehend these material drawings, it is nevertheless remarkable how close they bring us to such a distant world. And this is a testimony to the potential of drawing as language, but also to the fundamental relationship between materials and drawing. In

this sense the material imagination (which Gaston Bachelard once famously described as an 'amazing need for participation which, going beyond the attraction of the imagination of forms, thinks matter, dreams in it, lives in it or in other words materializes the imaginary') drives the architectural drawing process as much as the formal imagination. By working with materials while drawing, by analogy the tactile world is integrated more immediately into the design process. Keeping the material imagination alive through material drawings will enable us to better articulate the continuity between the theme or intention of a project and its final material form.

Mixed-media drawings (drawings that are made using a combination of hand and digital tools) can best open up such questions of intention and material articulation. Two such drawings, *Imaginary Cities 1* and *2* (pages 12 and 13), use a wide range of materials (from resin, natural glues and bitumen to canvas, jute, pigment, charcoal and translucent papers) to create a materially rich surface intended to articulate initial themes relating to memory, the history of the site. The drawings are combined with other kinds of contextual studies that focus on the spontaneous level of creativity as a preparatory stage of design. As Dalibor Vesely has described, the work is 'defined by the intention to return to the stage of design where the first attempt to visualize the content of design is taking place. The process of visualization can be described as materialization, or more precisely as the

first encounter with the material conditions of the later, more abstract stages of design.'<sup>3</sup>

At a later design stage, Steven Holl's delicate watercolour of the Chapel of St Ignatius (1997) focuses on light. Its luminous surface communicates the character of the colour and natural light of the building. The drawing explores formal and material ideas and uses the unique qualities of watercolour to achieve a glowing transparency to the overlapping 'bottles of light' (page 15). It explores the physical character of the drawing's surface and creates a reference to the actual material, rather than acting as straightforward illustrations of the materials to be used.

Bringing together several of these themes are the hybrid drawings of Sara Shafiei and Ben Cowd, whose work is representative of a new generation of architects. Their studio attempts to move conventional architectural drawings, such as sections and plans, off the page, from two-dimensional surfaces to three-dimensional constructs. The purpose of the work is to re-define and exceed the traditional limits of drawing, using new technology such as laser cutting to layer, wrap, fold and use the inherent burn from the laser cutter to convey depth and craft. Their drawings establish a tentative balance between ideas of craft while using newly established modes of design and technology, and recognizing the intrinsic linkage of drawing to innovative manufacturing techniques, transforming paper into models.



## About this book

This book explores the fluidity and continuity of drawing as a creative process of 'materializing thoughts'. It attempts to capture some of today's drawings and representational techniques. Ranging from digital drawings through to pencil and charcoal, the content is not exhaustive, but is designed to offer insight into techniques that may enable individuals to find their own voice through the act of drawing and making.

The book is in three parts: Media, Types and Places. Media explores the tools used to make drawings; it takes the position that the computer is one of a number of tools that can be used for architectural drawings, in an attempt to encourage experimentation beyond predictable software products. It discusses line drawings, render and mixed media.

The second part, Types, describes the most common drawing projections used in architectural drafting: these range from conventional projections to less conventional combinations of drawings. The final section, Places, describes three basic topographies that architectural drawings describe: interiors, landscapes and urban contexts. Each of these is illustrated with a variety of drawing types and media.

The book is intended to be both inspirational and practical. It is designed to encourage ambition and diversity in architectural drawing and, at the same time, to be a practical guide – a useful starting point, but not an exhaustive manual. A deeper understanding of drawing comes more directly from its practice.

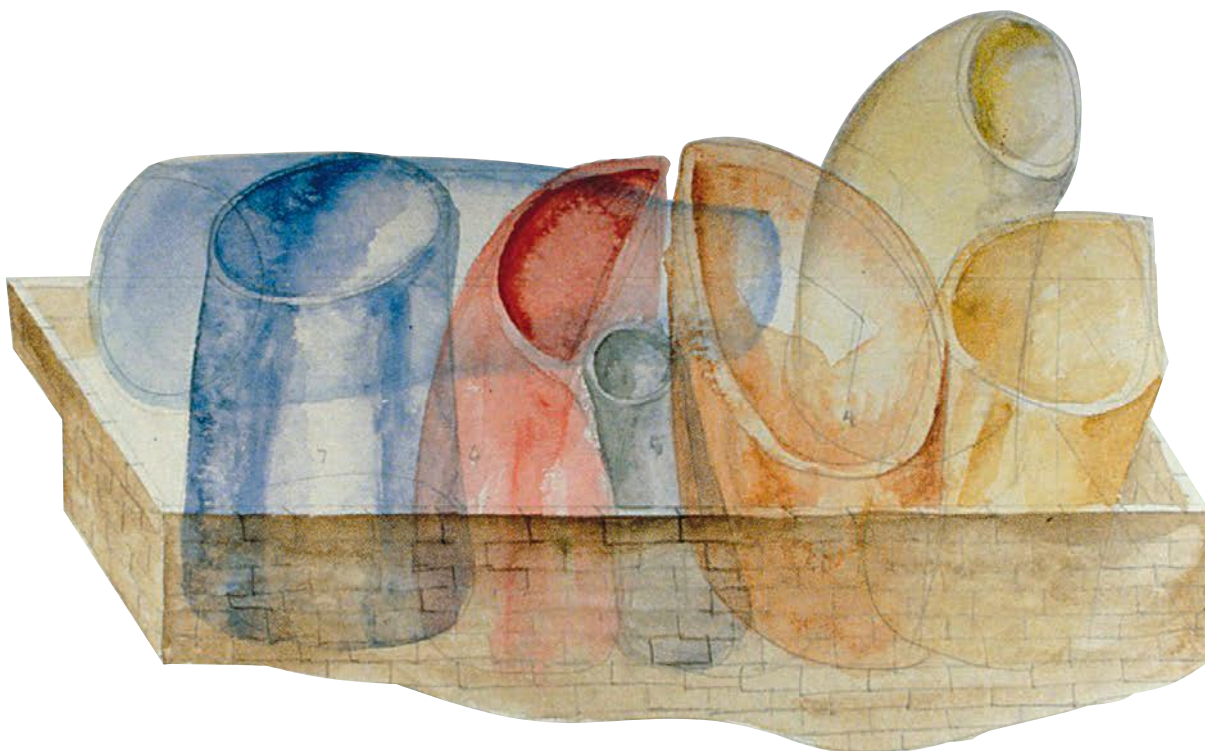
### Opposite

1:100 section of the Magician's Theatre, National Botanical Gardens, Rome, by Sara Shafiei (Saraben Studio). Made from laser-cut watercolour paper, the section illustrates the detailed patterning on the façade of the building, which allows light to filter through the skin and creates a 'glowing' theatre in the hills.

### Below

Chapel of St Ignatius, Seattle, Washington, Steven Holl Architects, 1997. Watercolour rendering showing light, colour and transparency of space.

1. Yves Bonnefoy, 'The Narrow Path Toward the Whole', in *Yale French Studies*, Number 84, Yale University Press, 1993
2. John Berger, *Berger on Drawing* (Occasional Press, 2005), p.102
3. Dalibor Vesely, foreword to catalogue *Material Imagination* (Artemis Edizioni, 2005), p.10. Exhibition of drawings by author held at British School at Rome, 2005







# MEDIA

**18** INTRODUCTION

**19** LINE

**42** RENDER

**72** MIXED MEDIA



## Introduction

This section gives an overview of the range of drawing tools available to the architect, with an emphasis on the representational techniques that may inspire students and professionals alike. The approach taken here is to assume that the computer is only one tool among many others. It explores traditional techniques as well as in-principle guides to CAD software in order to recover the breadth of expression still available to the architect. This is bound not to be exhaustive: it is intended only to cover some key practical tools that can be augmented with reference to other material, printed or online.

In dealing with digital media, the emphasis is to outline principles and approaches to working with certain types of processes and software types. The guides described here are meant to complement, rather than substitute, online tuition and manuals. The most fruitful way to learn technique, however, is through practical exploration, and the following section is intended to inspire a creative discovery of architectural drawing through the practice of drawing itself.

The text is prefaced with comments on drawing surface that affect all drawing techniques. This is followed by an exploration of line in drawings, the most elemental but individual of a drawing's components. When a drawing is developed a little further, the lines may begin to describe form in terms of light and shadow – and eventually render. The second section, render, looks at both manual and digital rendering techniques. Finally, a section on mixed media explores the creative use of combining the two, focusing on techniques that use a variety of materials or processes to create an image.

The characteristics of the drawing surface, its texture, surface durability and colour, are all important elements in the visual qualities of a drawing. This may be true for both manual and digital drawings, depending on output devices. On the whole, manual drawings can take more advantage of different kinds of surfaces: luminosity of the surface is, for instance, particularly important with techniques such as watercolour where thin, translucent coloured glazes allow light to reflect off the paper or gesso surface.

Typically, architects will work on, and certainly print out on, paper. Papers are differentiated first according to the texture and density of their surface. The smoother of these have a surface created by the application of pressured, heated steel surfaces 'hot-pressed' (HP). 'Not' papers (meaning not 'hot pressed', but rather cold pressed – or 'CP') tend to have a coarser (medium or rough) texture.

Both HP and CP papers are also distinguished by weight. As a general rule CP (Not) surfaces are

### Below

*Landscape Study*, detail, using charcoal, pigment and white spirit on canvas.



sympathetic to washes and larger-scale drawings whereas HP surfaces are good for line drawings. Coating either kind of paper with acrylic gesso can make the paper more suitable for other media. Standard 'tracing' paper is best avoided in favour of the translucent layout papers now available. Drawing film is more robust and picks up less dirt. It takes pencil or coloured pencil particularly well and interesting layers can be built into the film by drawing on both sides.

## Line

Lines are the most vital components of almost any drawing. Great drawings are read through the character of individual lines and lines come together to define the spatiality of the drawing: lines are like boundaries and as such open up spatial relationships on a page.

The immediacy of a line is the most direct way to visualize thought and observation and as a line drawing evolves, and line weights differentiate, it can express a spatial depth and also define gradations of light and shadow.

Lines are as varied as the instruments used to make marks and the surfaces to be drawn on. Lines can be made with almost anything and media selection depends on individual approach, but as a general rule the combination of drawing surface and drawing tool should be chosen to facilitate a variety of lines; compare for instance the limitation of thin tracing paper with the rich surface of Indian cotton rag paper. For the same reason, you might opt for soft pencil over a fibre-tipped pen, but the final choice will ultimately depend on the nature of the drawing, how detailed it is, its scale and how it is to be seen: will it be viewed close up, from a distance or both?

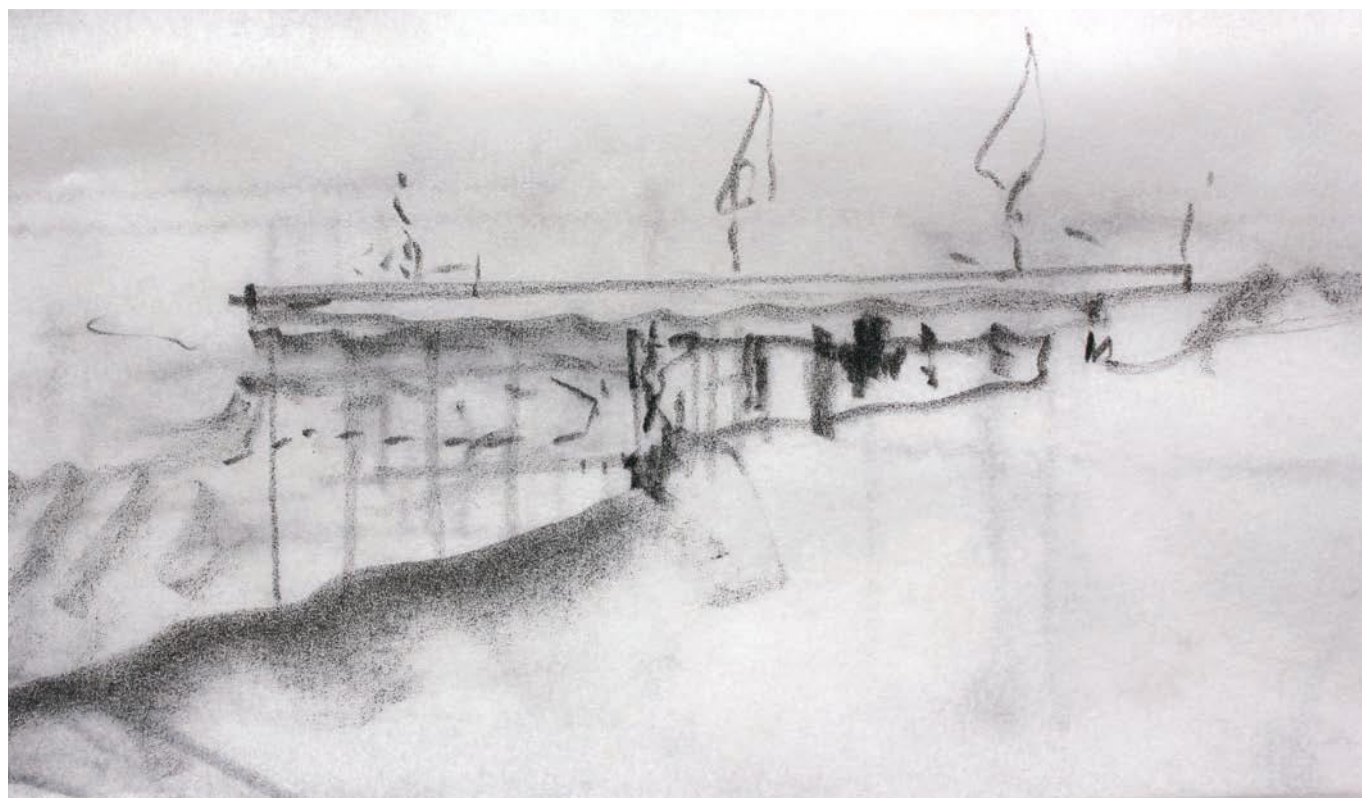
When drawing by hand, each of us will instinctively make different marks and draw different kinds of lines. These primitive elements of drawing are the most spontaneous reflection of our visual thinking and creative imaginations. They reflect the ways in which we bring together a design as a complex and synthetic process, and in them we can reflect on divergent paths, opportunities and ideas that would otherwise be articulated with difficulty.

## Below

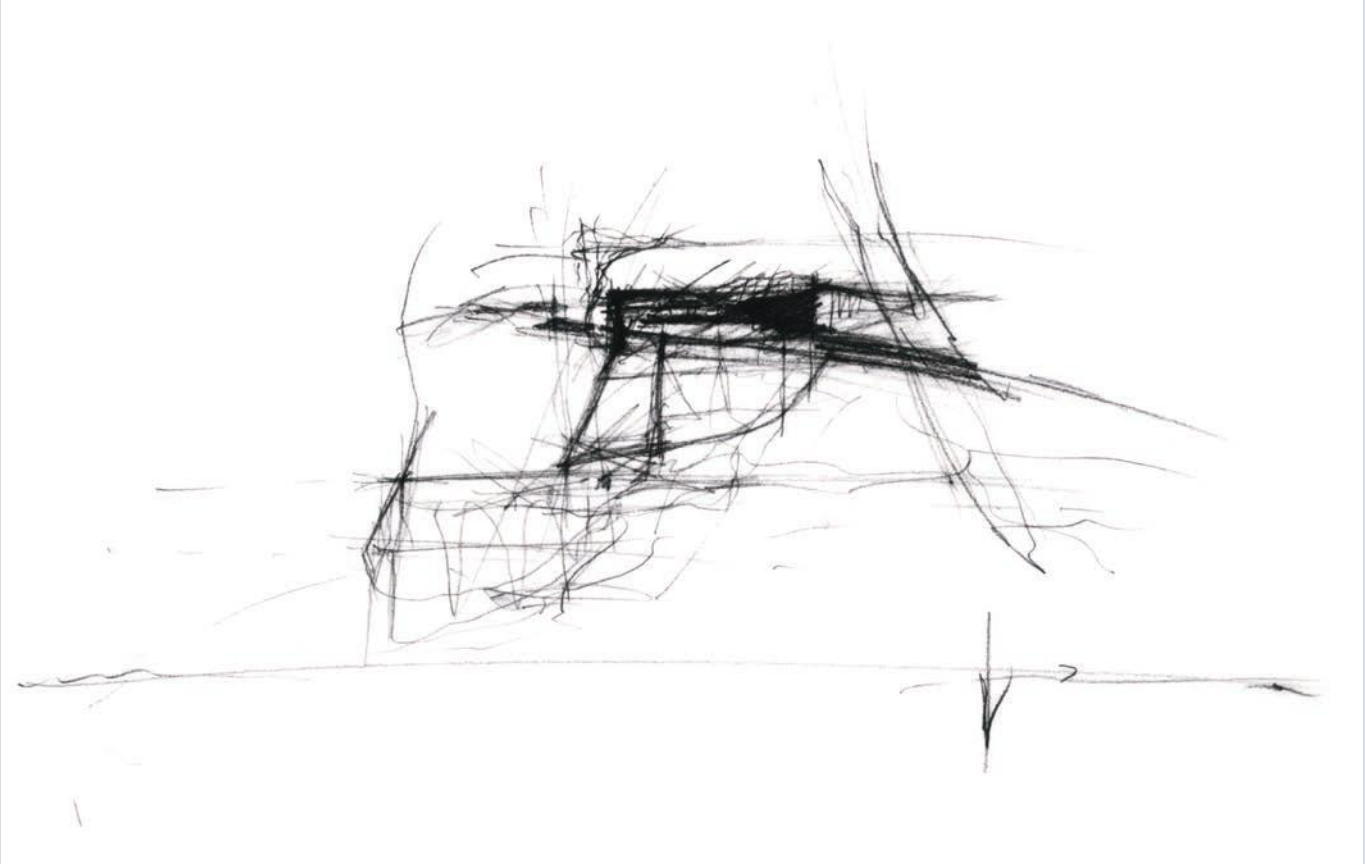
Sketch section: this rapid pencil sketch is drawn with a soft pencil with a thick lead. Using varying line weights and the side and tip of the pencil, the variety of lines establishes ground line, building profile and sketch outlines for glazing and structure. When using pencil in this way, use a translucent paper such as layout or drafting paper. Tracing paper holds pencil much less well.

## TIP PENCILS

Draw by hand with a sharp pencil; reserve pencils softer than 'F' for sketching. Pencil work is a layered process and softer pencils can make the drawing appear too black.



## Case Studies: Line



1

1. Here the spontaneity of a line drawing is wonderfully illustrated in the sketch for Open House, Malibu, California (1983/1988–1989), by Wolf D. Prix and Helmut Swiczinsky of Coop Himmelb(l)au. The architects call this drawing an explosive sketch. In a process that recalls the Surrealists' automatic writing from the 1930s, they describe the drawing as having been done with 'eyes closed in intense concentration; the hand act[ing] as a seismograph, recording the feelings that the space will evoke.' The authors go on to explain that 'it was not the details that were important at that moment, but the radiance of light and shadows, brightness and darkness, height and width, whiteness and vaulting, the view and the air.' The differentiated line weights portray a sense of a structure that appears to float, of an ambiguous boundary between interior and exterior and of a spatial sequence that negotiates a steeply inclined landscape.

The sketch is fascinating in its incompleteness; it is both open and closed. It is precise in what it does represent and at the same time open to interpretation and participation by both author and observer in a reflection on the possible worlds that the lines frame in their extensity and depth.





2

2. Creative line work can be identified in the work of Perry Kulper, an American architect whose body of drawings challenges the way we think about representation. (Several of his works are featured in this book.) Here two line drawings describe a process of thinking as much as a finished proposal. They are done on plastic film (mylar) in a variety of media. Working with specific themes, landscapes and strategies for intervention, Kulper explores the drawing as a tableau that, through line alone, becomes a delicate matrix of spaces that shift in and out of the page; lines

that flow or halt and arrest the view. By using each side of the film the drawings emerge as though from construction lines, through lines that describe boundaries; open suggestive patterns of intervention and means of occupation. They are beautiful examples of how, with a limited palette, such a mysterious landscape that is part carefully constructed artifice, and part expressive marks, can be evoked.

The variety of lines in these drawings is in part a graphic tool, and in part a developmental process about the way in which the drawing

develops over time. Lines establish the drawing's pace, becoming more or less dense, and take on the qualities of light and shadow. These drawings use lines as tools with which to think about a design; they are open-ended and are vehicles for further reflection that serve a vital role in driving the design forward.

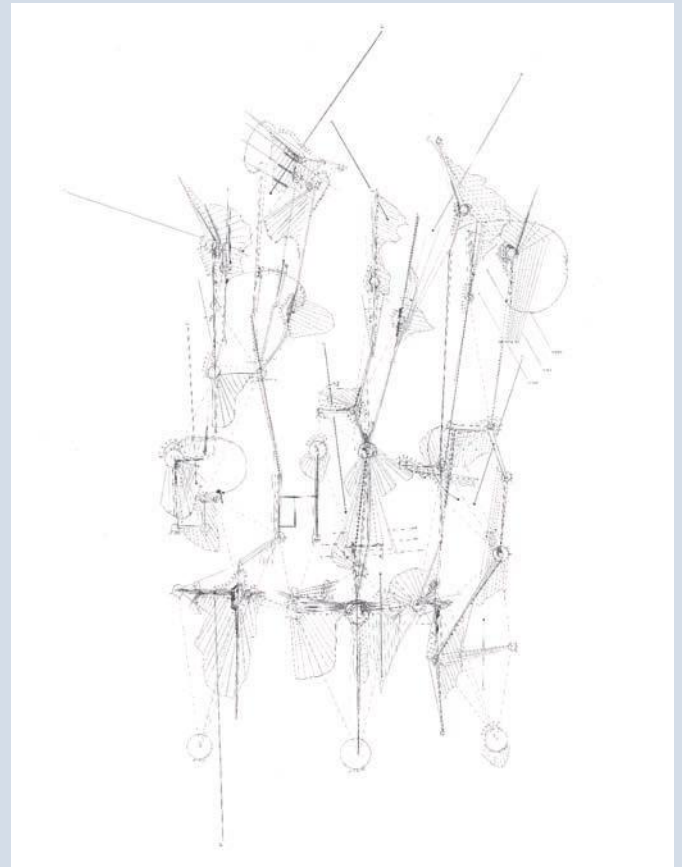


3

3. This rapid ink sketch by David Dernie uses a thick-gauge nib dipped in India ink. Drawing with different sides of the nib can alter the thickness of line. In this way, line weights and areas of shadow can quickly establish ideas of structure and form. Ink sketches allow ideas to be tested rapidly, and work best alongside other digital or analogue drawings that have more dimensional control.



4a



4b

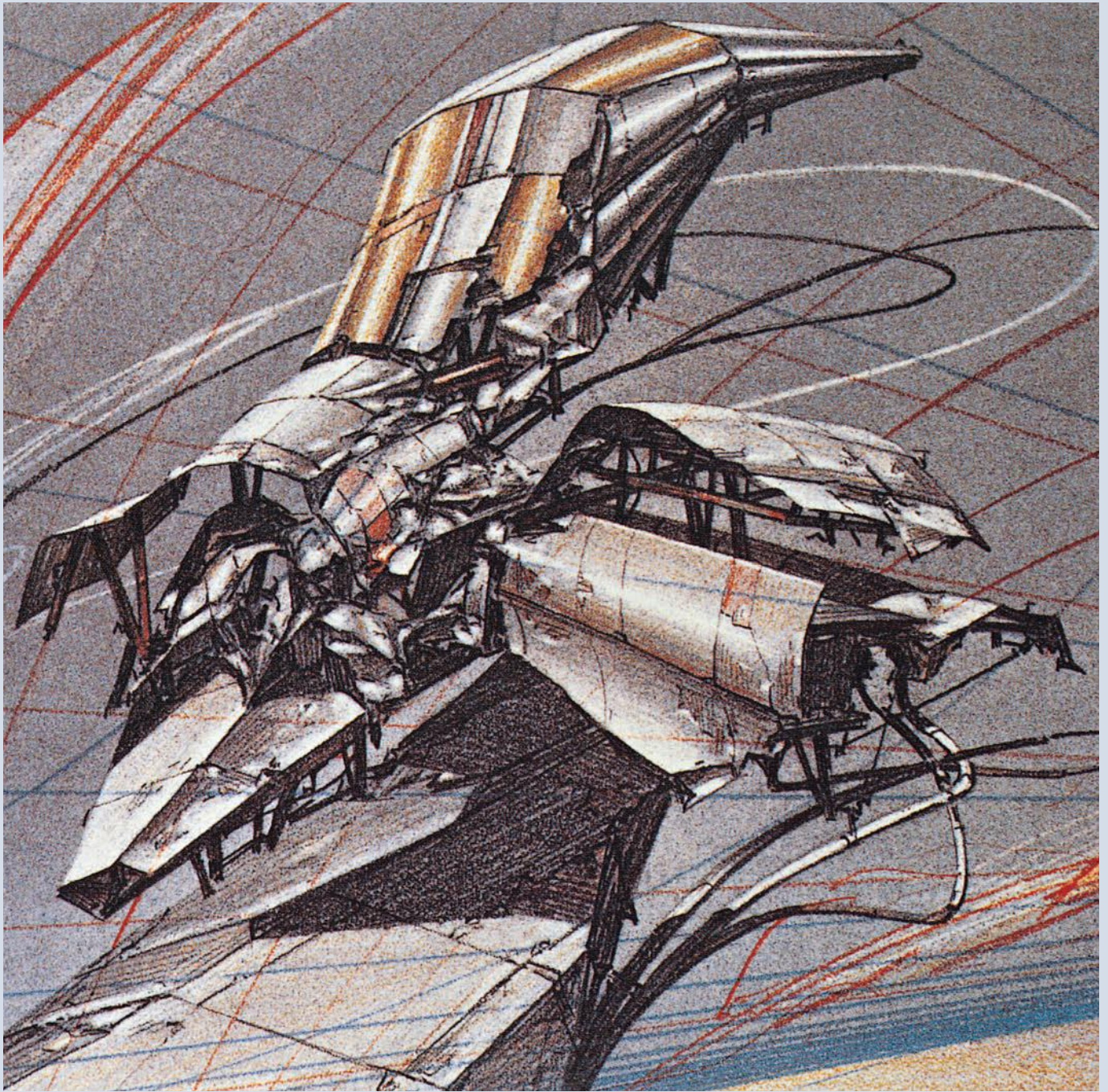
4a, b. These freehand pencil drawings by Owen Dore are for a seasonal residency for tourists on the idyllic Swedish peninsula of Skanör med Falsterbo. The drawings are from a series that looks at issues of tribology (the study of the interaction of surfaces through mechanical, geological, engineering and material-science disciplines), friction, lubrication and wear.

4a: The pencil lines and colour combine in an investigation of a structural grid for inhabitation, incorporating wear and degradation of surfaces at areas where greater contact occurs and therefore identifying where extra binding will be required. 4b: A freehand pencil investigation of a new structural grid based on the diagrams of friction.



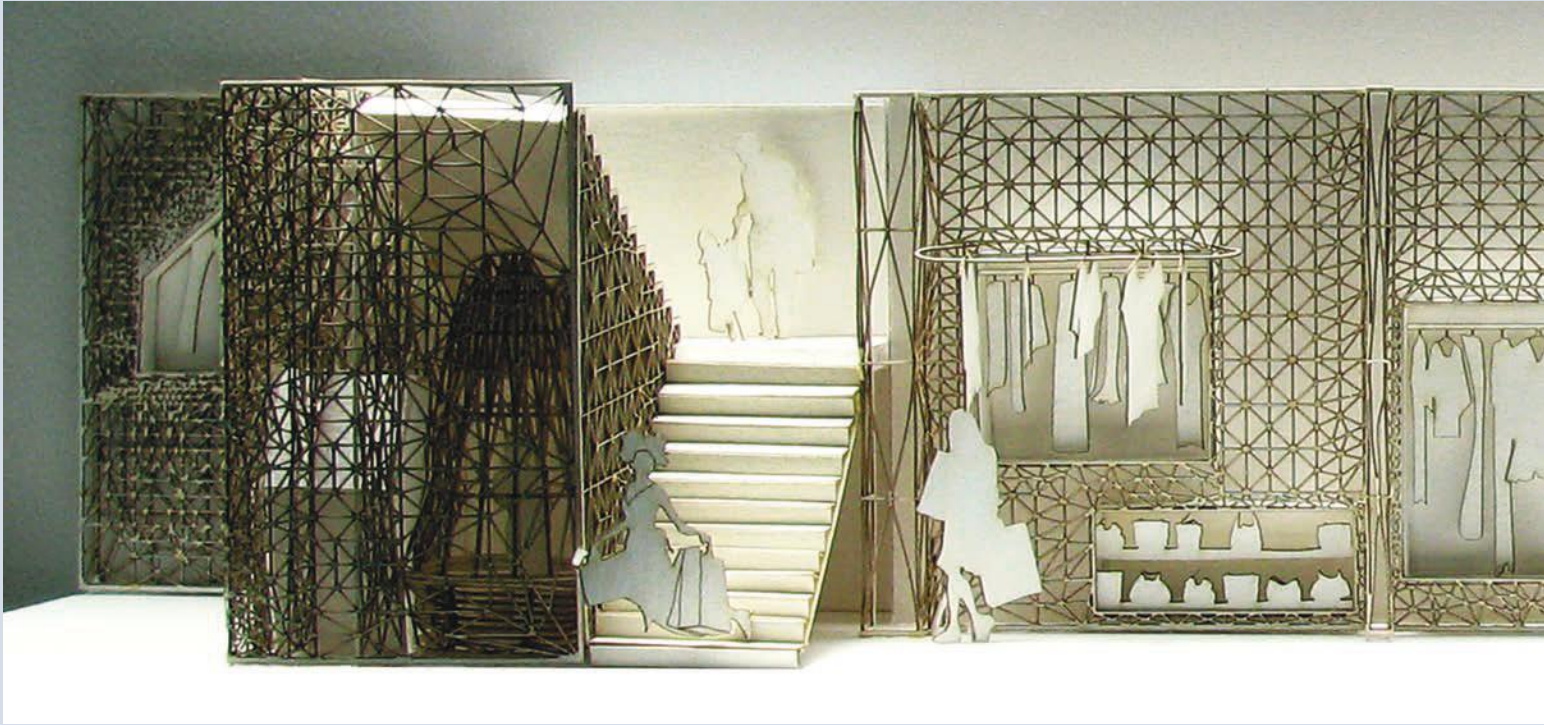
5. Sound Travels, Archi-Tectonics. In this study an initial wire-mesh model, the undulating surface of which was inspired by a music score, is extended and the forms are rendered digitally using light to investigate form (for another image in this study see page 42).





6. Lebbeus Woods, Berlin Free Zone, 1991.  
The image is characterized by expressive line work and a graphic style that relies on a balance of line, shadows and light for formal definition.

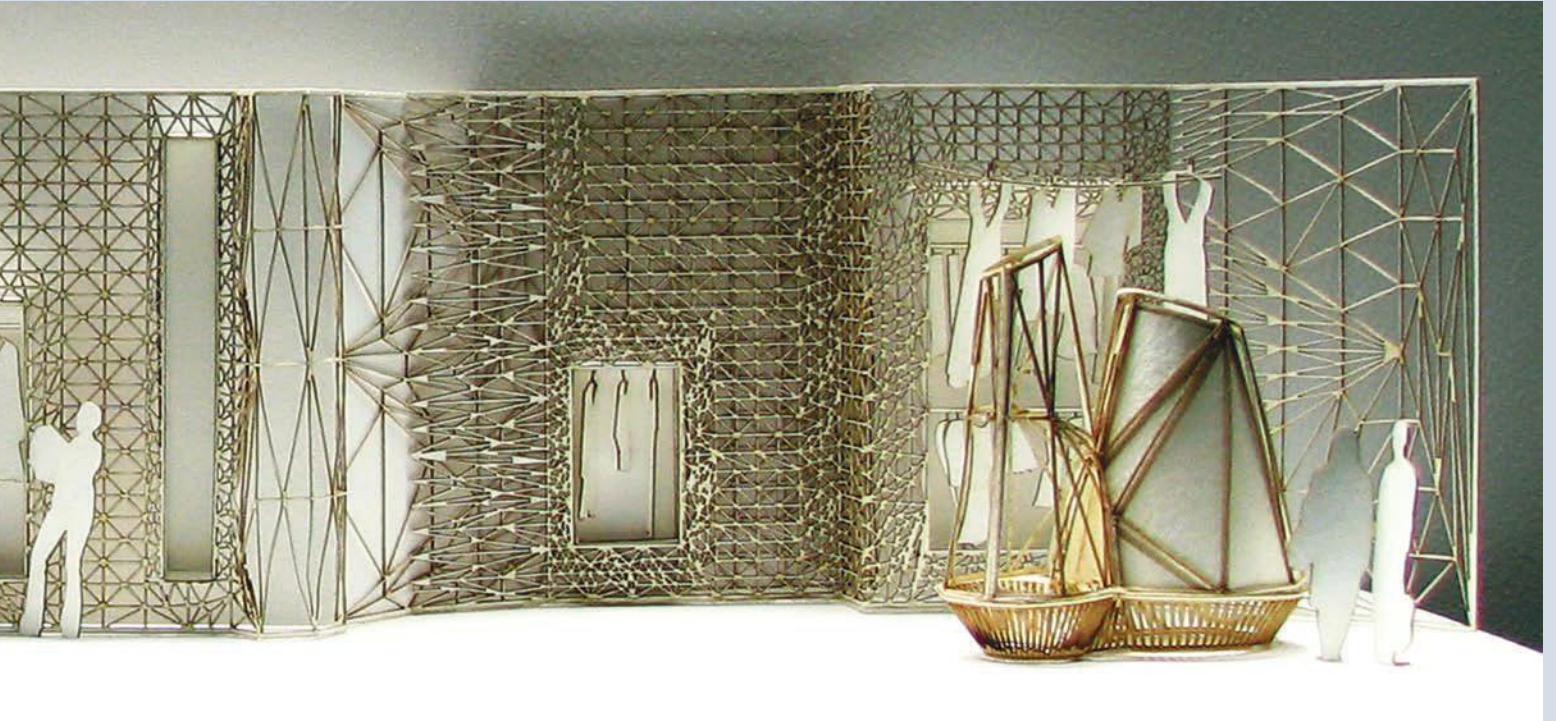




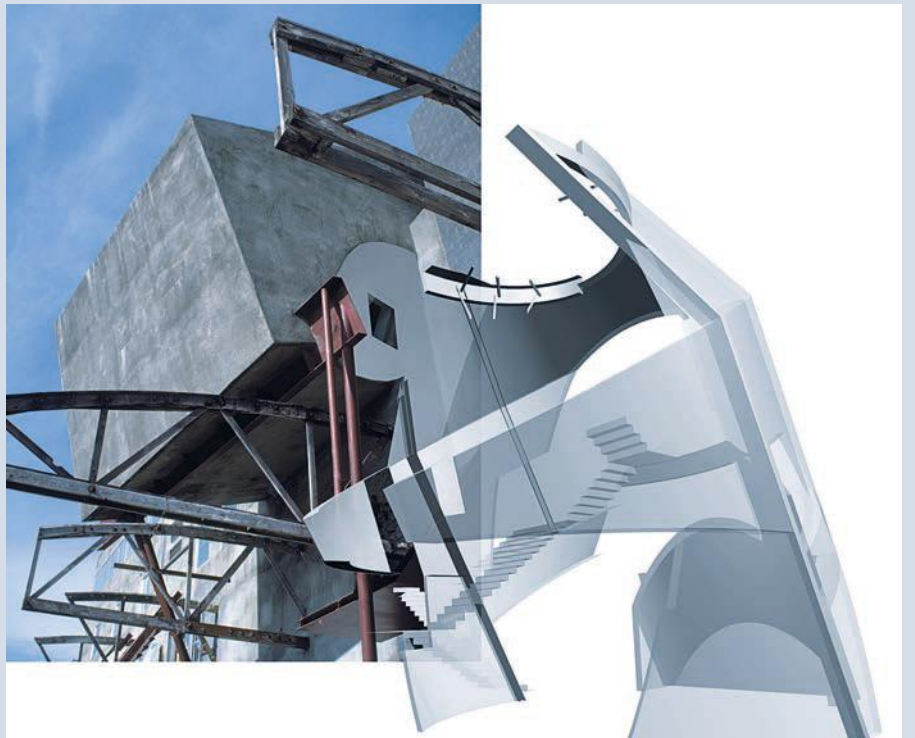
7. Ben Cowd and Sara Shafiei of Saraben Studio's RAASTA store interior view is a three-dimensional drawing made out of laser-cut watercolour paper, challenging the boundary between drawing and modelmaking. The use of lines is developed three-dimensionally, as a decorative and structural geometry that defines spatial boundaries and interior scale.

8. Eric Owen Moss: Pittard Sullivan, Los Angeles, California.

An effective collage technique that combines photographic and digital renders. Note the restraint of the digital model and the way in which lines of shadow and structure, both drawn and photographed, combine to form an effective collage that is full of movement. The continuity of lines across the drawings makes the collage visually coherent, even though it comprises two quite different drawing techniques.



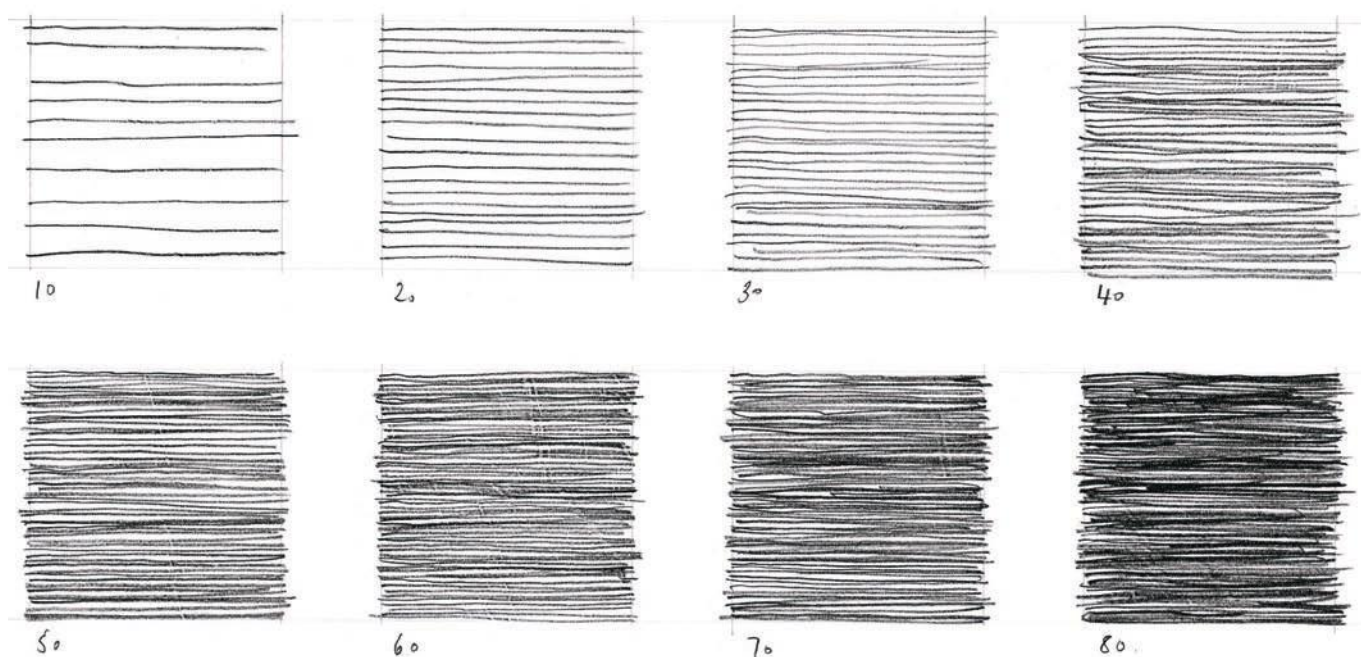
7



8



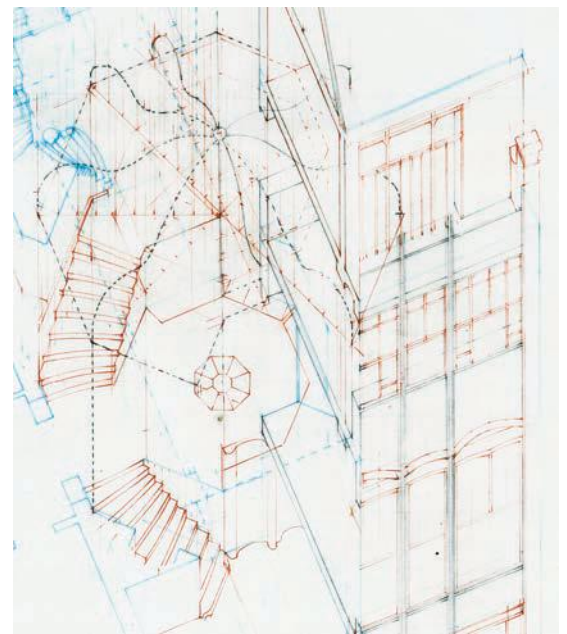
# STEP BY STEP PENCIL



**1** There is a range of mechanical pencils and traditional wood-sheathed pencils (which have changed little since the mid-eighteenth century). Pencil cores vary in hardness (according to the mix of graphite and clay). Different makes of pencil vary, but can range from 9H (very hard) to 9B (very soft). The mid range, 2H to 2B, serves most purposes. For detailed work, F – midway between H and HB – is perhaps the softest pencil you might use, whereas sketching can be done with any pencil – often with a B or softer.

**2** Precise architectural drawing requires a sharp pencil. A long lead, made by carefully sharpening the pencil with a scalpel (as opposed to a pencil sharpener) gives more accuracy. It allows the pencil to be brought tight in on a ruled edge and also means that the line weight is more even as the pencil wears.

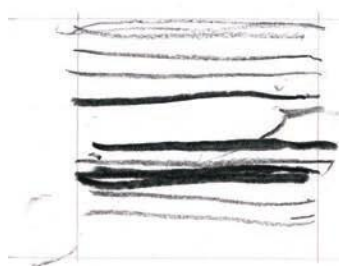




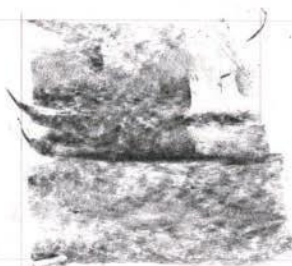
- 3 Axonometric in pencil and coloured crayon, drawn on both sides of drafting film (mylar). Note the feathering of lines. A feathered line is one where the weight is gradually reduced from thick to thin along its length. Feathering both ends of a line in an architectural drawing gives a line a 'beginning, middle and end'. The line appears to be held at each end in the space of the page, giving the drawing both a sense of precision and lightness of hand. Note also that none of the corners cross.

# STEP BY STEP CHARCOAL

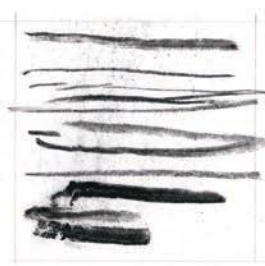
Charcoal is a diverse, sensitive drawing medium. This study by artist Helen Murgatroyd shows a charcoal stick used to make a variety of drawn lines, using different pressures and different parts of the charcoal. Textural effects can be made using a tapping movement or by rubbing the charcoal onto a textured material through thin paper. Smudging soft charcoal will give a grey tone, like a wash, which then can be fixed and combined with line work in harder charcoal.



1 Thin charcoal, various pressures



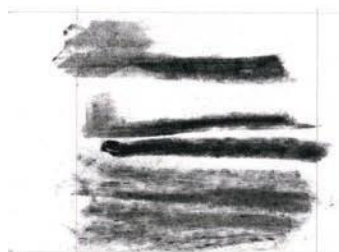
2 Charcoal sideways



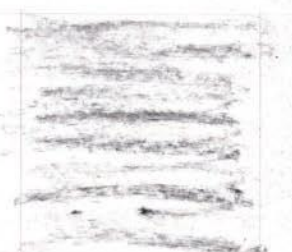
3 Snapping as you draw



4 Using finger



5 Thick charcoal, various pressures



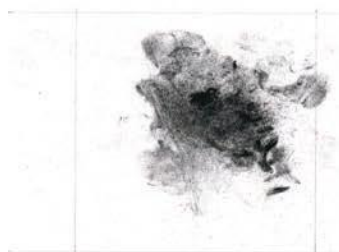
6 Soft pressure



7 Hard pressure



8 Repeated tapping



9 Broken crumbs rubbed in



## Far left

Soft willow charcoal was used to achieve a variety of marks in this sketch.

## Left

Charcoal comes in a variety of sizes and densities.



# STEP BY STEP CHARCOAL AND PHOTOSHOP

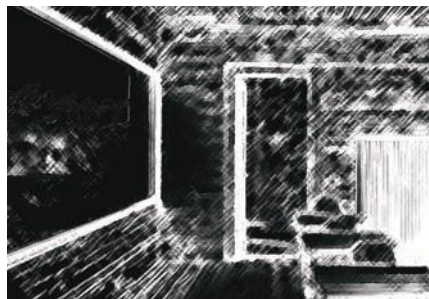
These images illustrate how Photoshop filters can approximate to charcoal or pastel-like line qualities. All of these effects can be found in the Filters palette under Artistic.



- 1 Film Grain with medium grain and intensity.
- 2 Charcoal with thickness mid range and maximum detail.
- 3 Charcoal with thin weight, medium detail and lightened. Finally image is inverted.
- 4 Conte with mid foreground, high background, low scaling and minimum relief.
- 5 Chalk and Charcoal with mid charcoal and chalk area and mid stroke pressure.
- 6 Chalk and Charcoal with charcoal area high and chalk area and stroke pressure low.



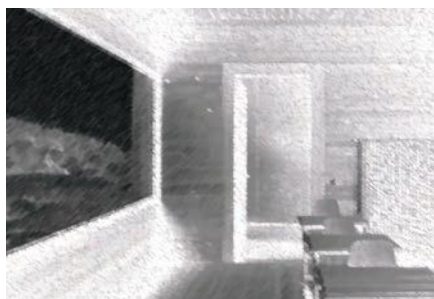
1



2



3



4



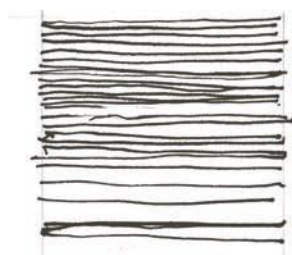
5



6

## STEP BY STEP INK

This exploration of marks and lines in Indian ink by the artist Helen Murgatroyd includes (top left to bottom right): fountain pen at different speeds and with different sides of the nib, a blunt metal tool, brushes of different thicknesses and shapes, a roller, a comb spatula, a pencil end and, finally, the lid of the ink pot!



1 Fountain pen, normal speed



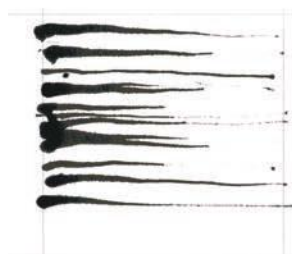
2 Fountain pen, very slow



3 Fountain pen, fast with very little ink



4 Fountain pen, reverse of nib



5 Blunt metal tool



6 Blunt metal tool with less ink



7 Thick paint brush



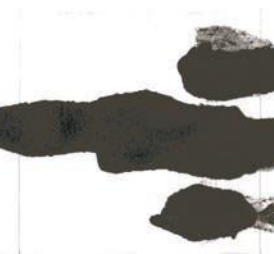
8 Thin paint brush



9 Thin paint brush, less ink



10 Thick paint brush on side



11 Rubber roller



12 Rubber roller, less ink



13 Comb spatula



14 Blunt end of spatula



15 End of a pencil



16 Lid of ink pot

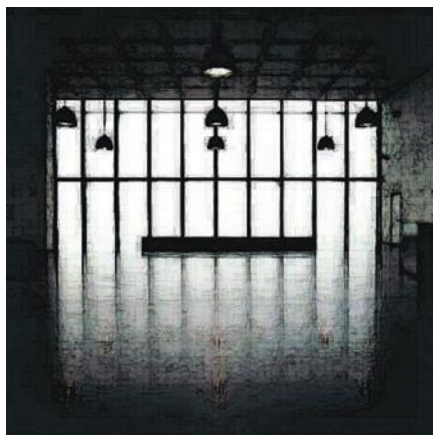


## STEP BY STEP INK AND PHOTOSHOP

These images illustrate how Photoshop filters can approximate to brush-like qualities. All the effects can be found in the Filters palette under Brush Strokes.



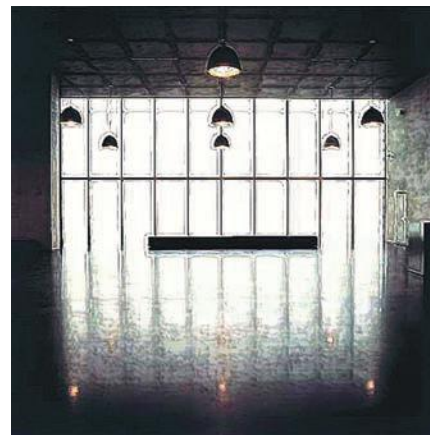
Original image



1 Accented edges



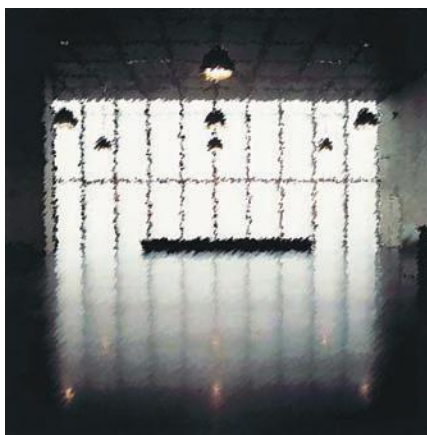
2 Angled strokes



3 Ink outlines



4 Sprayed strokes



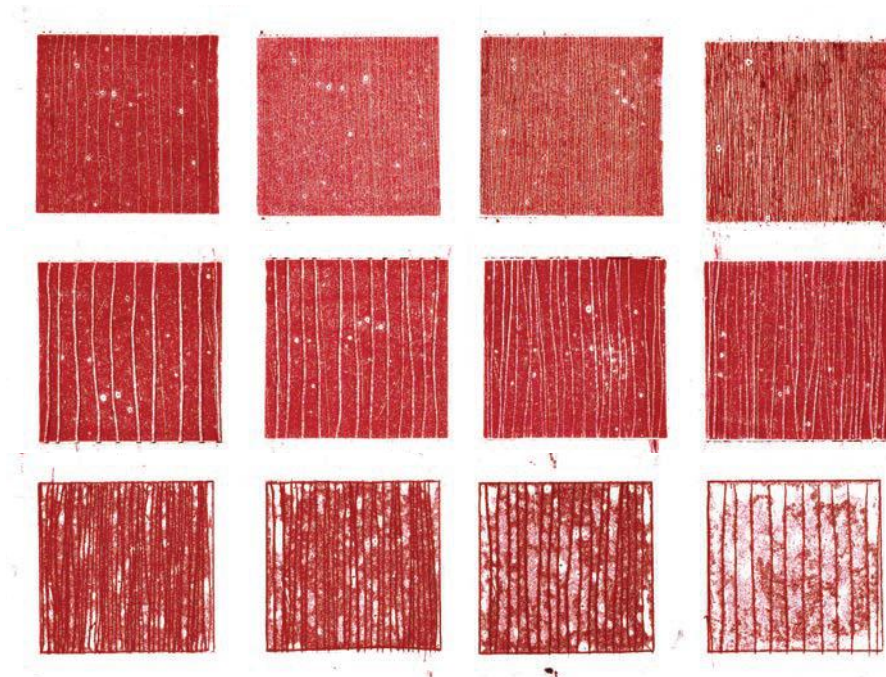
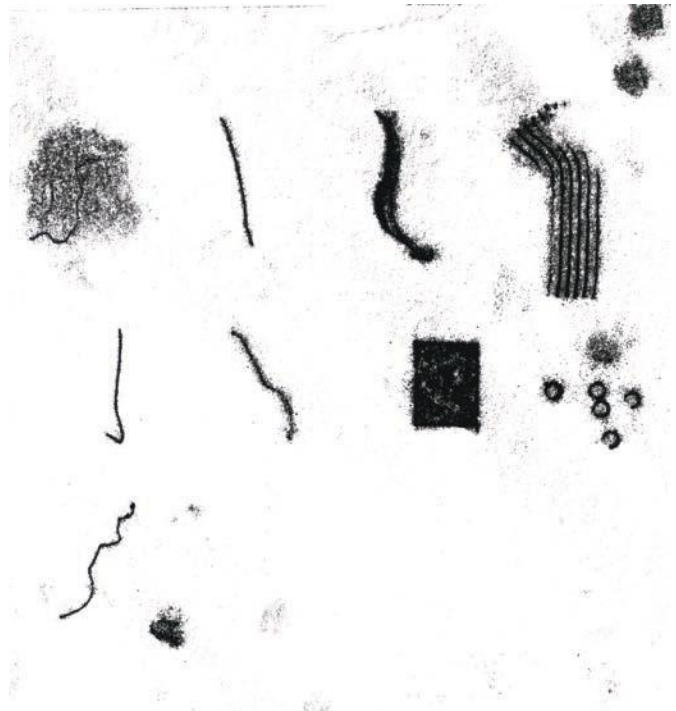
5 Splatter



6 Sumi-E

## STEP BY STEP MONOPRINTS

Monoprinting is a simple form of printmaking. Basic monoprints, known as direct trace drawings, produce soft-edged lines and tonal effects. Printer's ink is laid onto a surface (for example, a metal etching plate, vinyl, glass or sealed cardboard), paper is placed on top and drawn on, transferring the ink onto the paper as a reversed image.

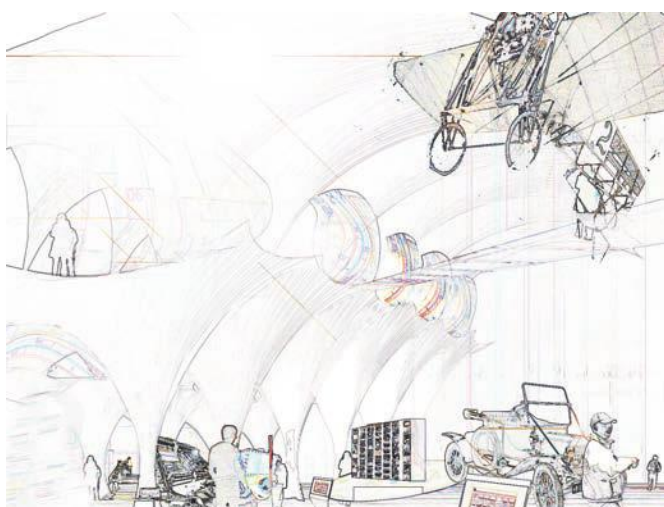


- 1 These marks and lines illustrate the variety and textural qualities that are possible in monoprinting. Marks are made using a variety of instruments, including pencils, comb spatula and fingers.
- 2 The simple technique of monoprinting can produce the effect of lines against a textured tonal background. A palette knife or pencil is used to draw onto ink or to take ink off the plate before pressure is applied.



## STEP BY STEP PHOTOSHOP

Photoshop is an invaluable tool for visualizing space. In this case CAD modelling software was used to create initial structural forms for a museum and exhibition space. Using transparent layers of texture and colour, the original forms take on material qualities. The Transform tool on the Image menu is particularly useful in adjusting scale and alignment of overlaid objects and layers.



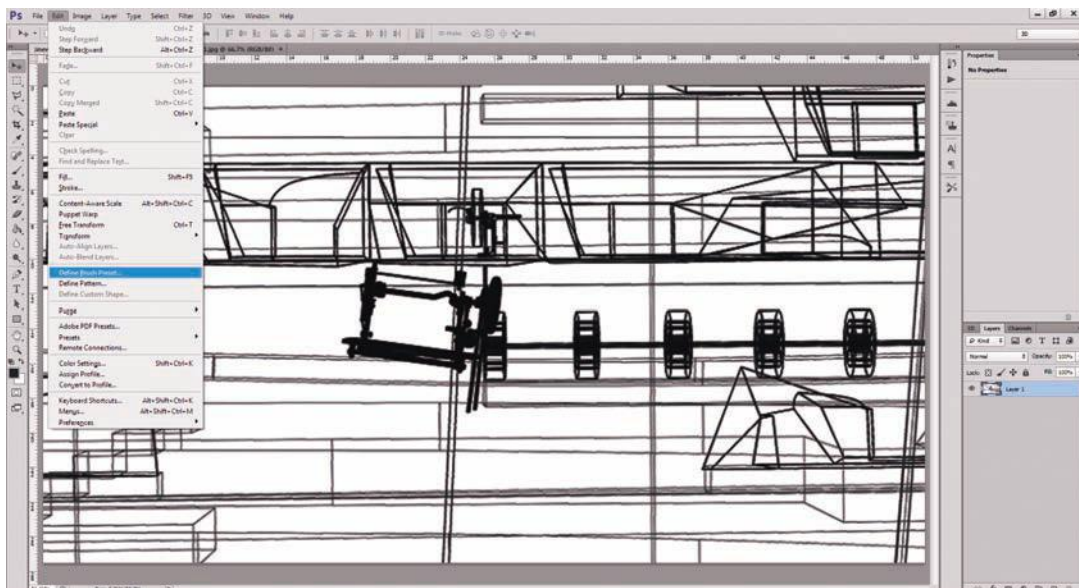
### Left and above

The initial sketch collage was made using Photoshop collage over a form-finding model (above). Using the command Stylize>Find Edges on the Filter menu, the collage is turned into a simple line drawing (left).

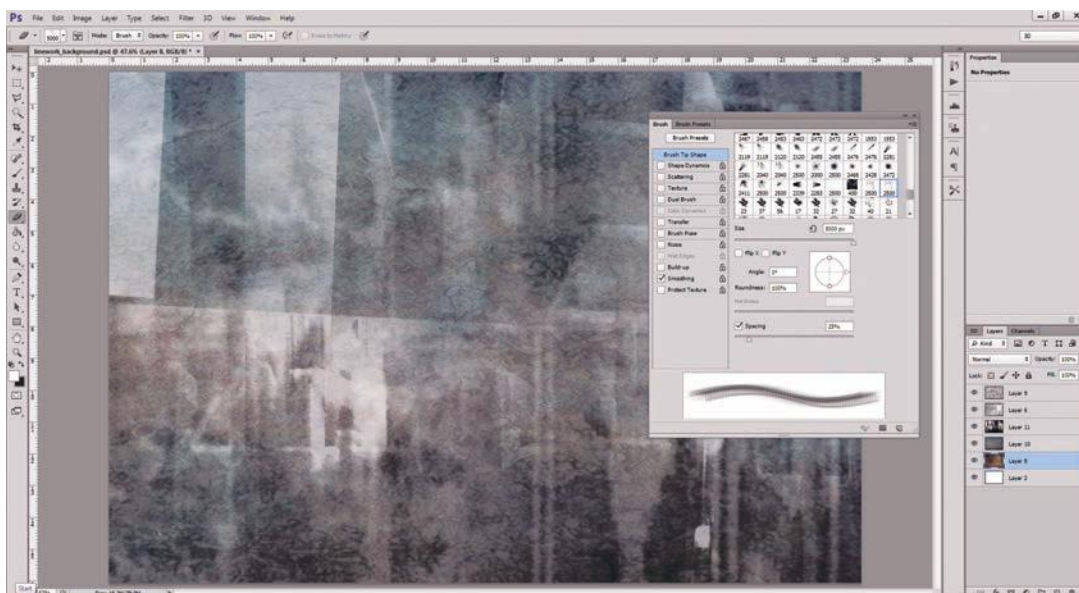
# STEP BY STEP LINE WORK IN PHOTOSHOP

Line weight is a key component of any drawing. What is appropriate will depend on the nature of the drawing, the size of the printout or scale of the drawing, and level of detail. Line weight will also affect how the drawing is to be read. Different line thicknesses and types can be easily assigned to layers in CAD, but other, more subtle, variations in the quality of lines are more difficult to simulate digitally.

A touch-sensitive drawing tablet and stylus can help to draw lines in a more traditional manner (for example with feathering), but Photoshop tools can also help to adjust the qualities of lines in order to enhance their spatial reading. In the following sequence, Maria Vasdeki illustrates how CAD-generated line drawings can be edited in Photoshop to imply spatial and ambient qualities.

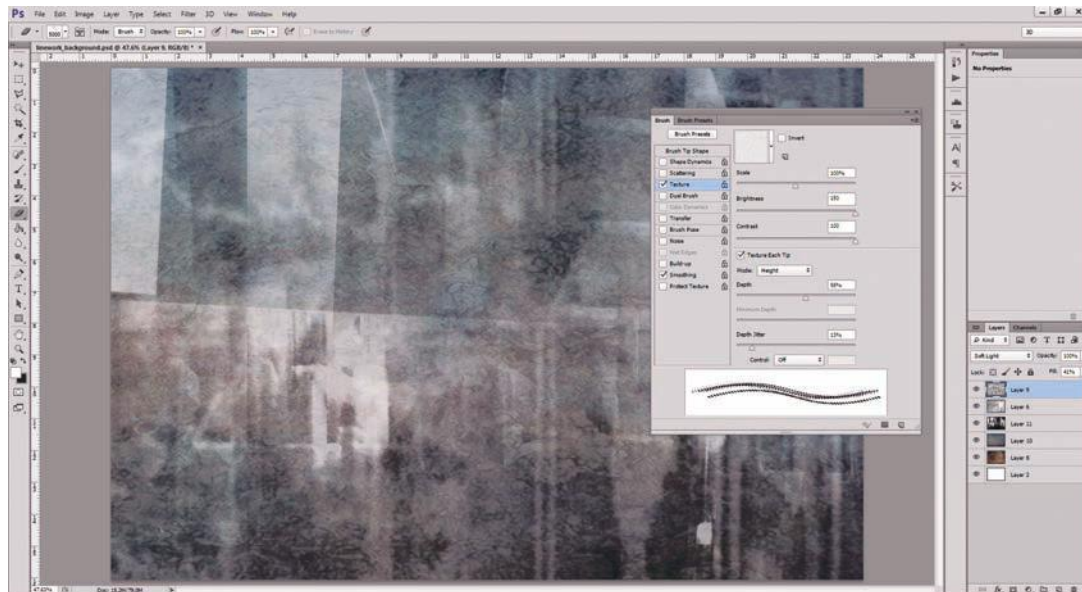


- 1 A line drawing is imported into Photoshop, selected via Select>All, and made into a custom brush: Edit>Define Brush Preset.

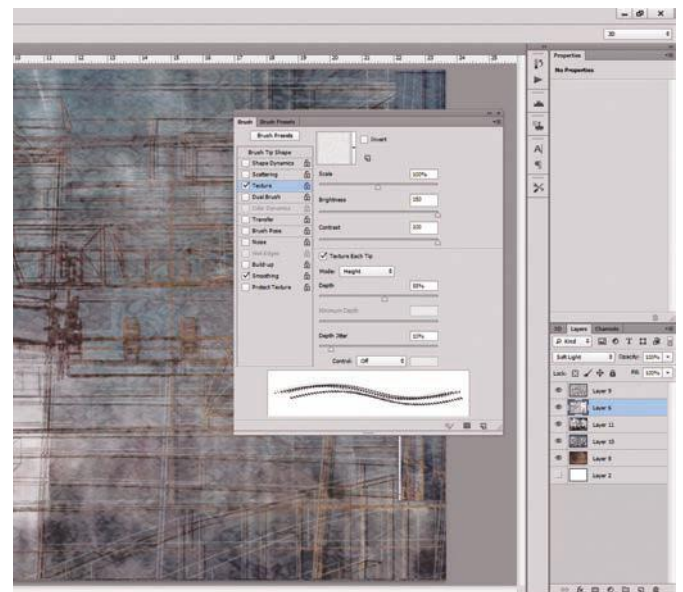
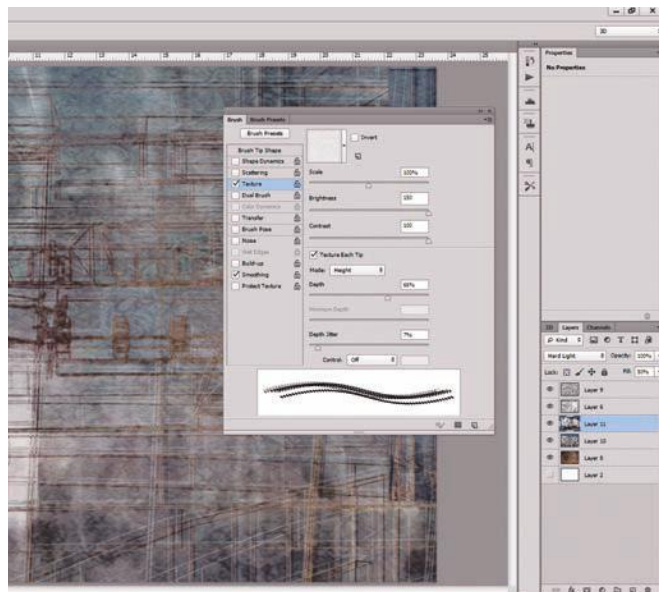


- 2 A pre-made collage is imported into Photoshop and the Eraser tool selected. The line drawing that was turned into a brush is selected as the Brush Tip Shape in the Brush panel (Window>Brush).

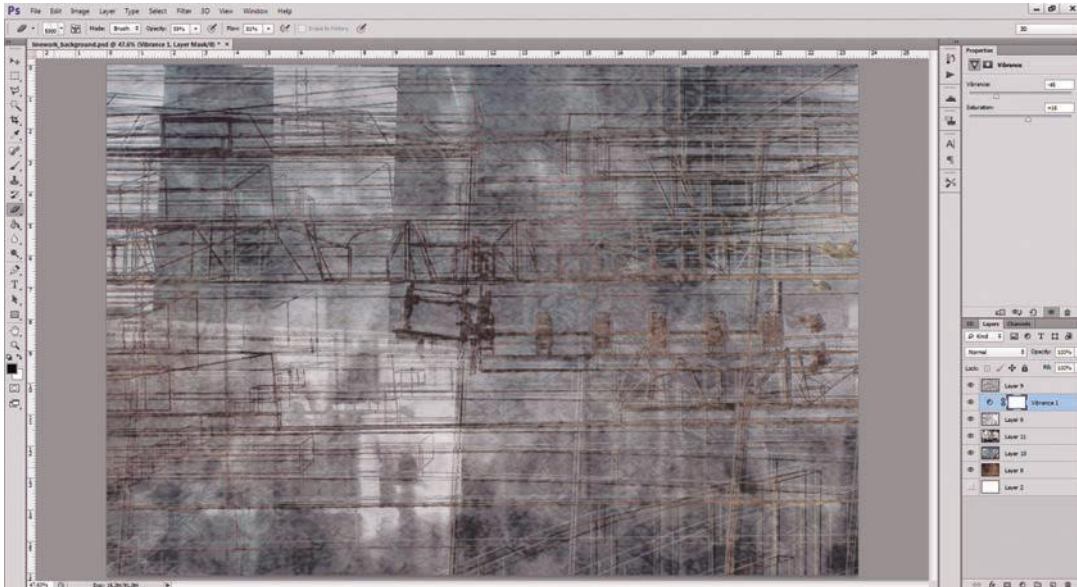




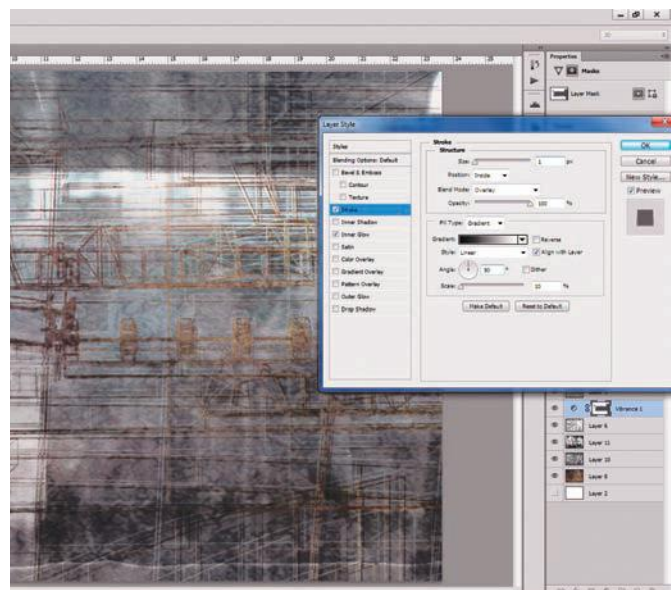
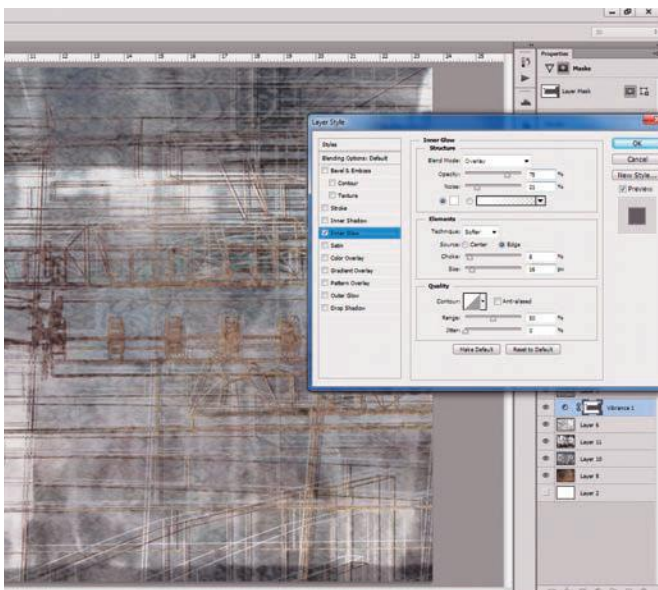
- 3 In the Brush panel, a depth value is set in Texture and the option Wet Edges is turned on. The custom Eraser tool is then used on the last layer of the background.



- 4 The custom Eraser tool is used on all layers except for the top one, but with different Texture, Opacity and Flow values. This will add a discreet depth and distinctive texture to the final image.

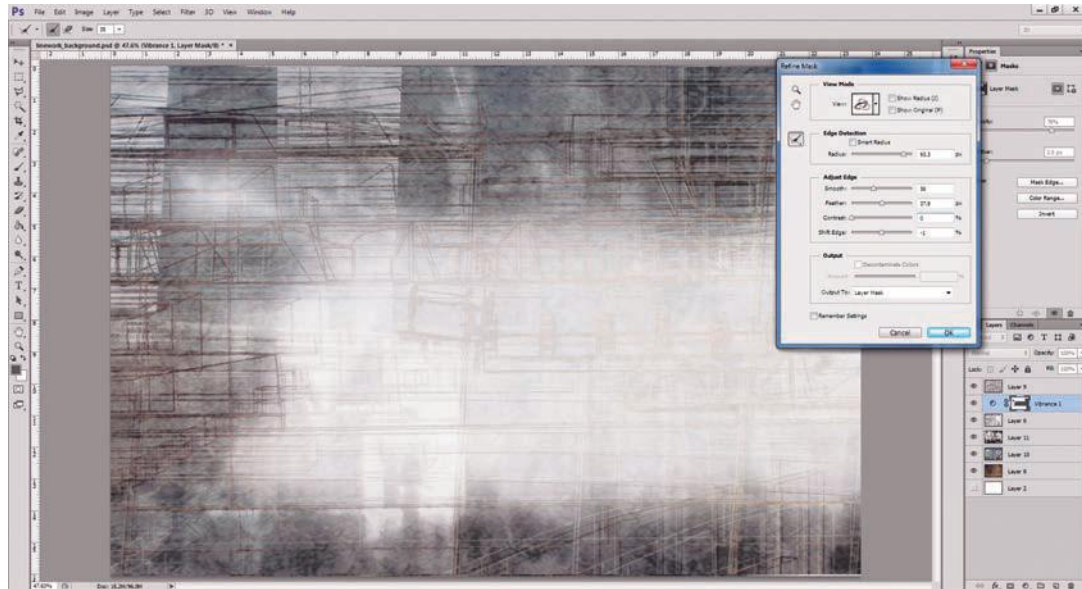


- 5 A new Adjustment Layer is created: Layer>New Adjustment Layer>Vibrance. In the Properties panel (Window>Properties), Vibrance is set to -48 and Saturation to +16.

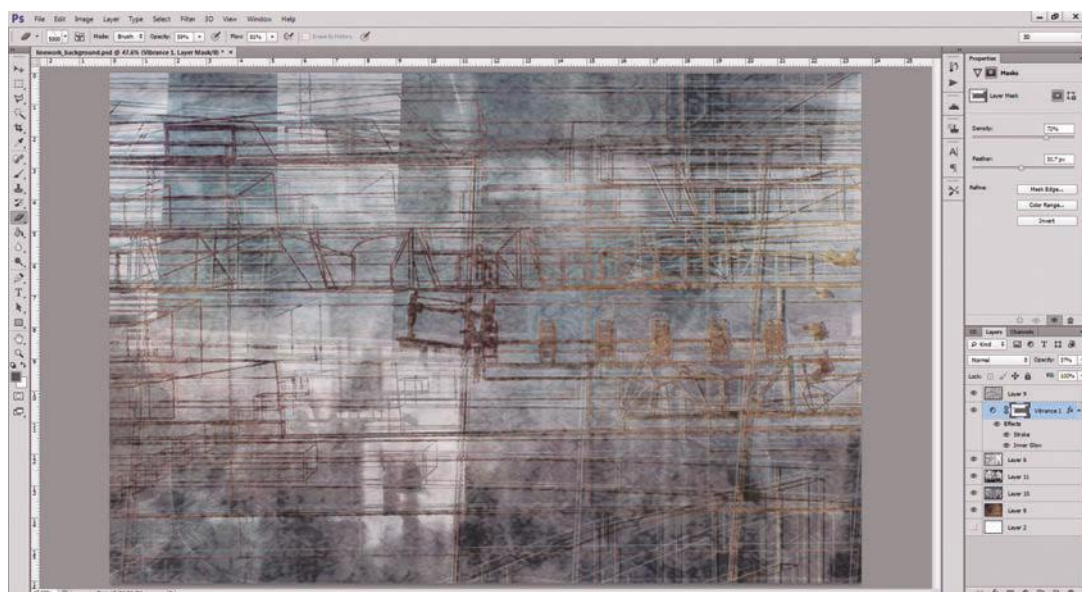


- 6 The Inner Glow and Stroke effects are applied by right-clicking on the layer and selecting Blending Options.

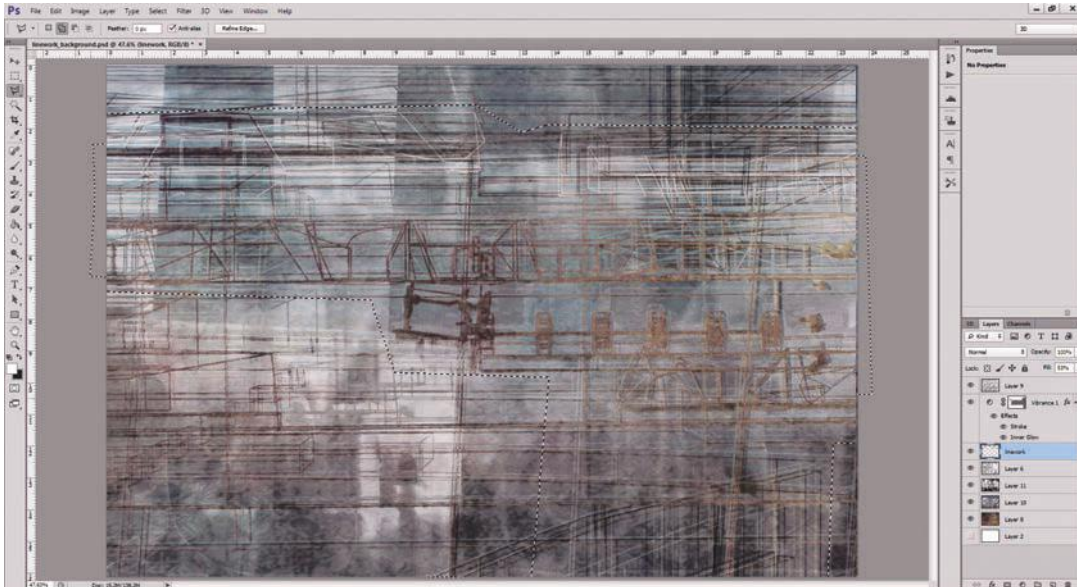




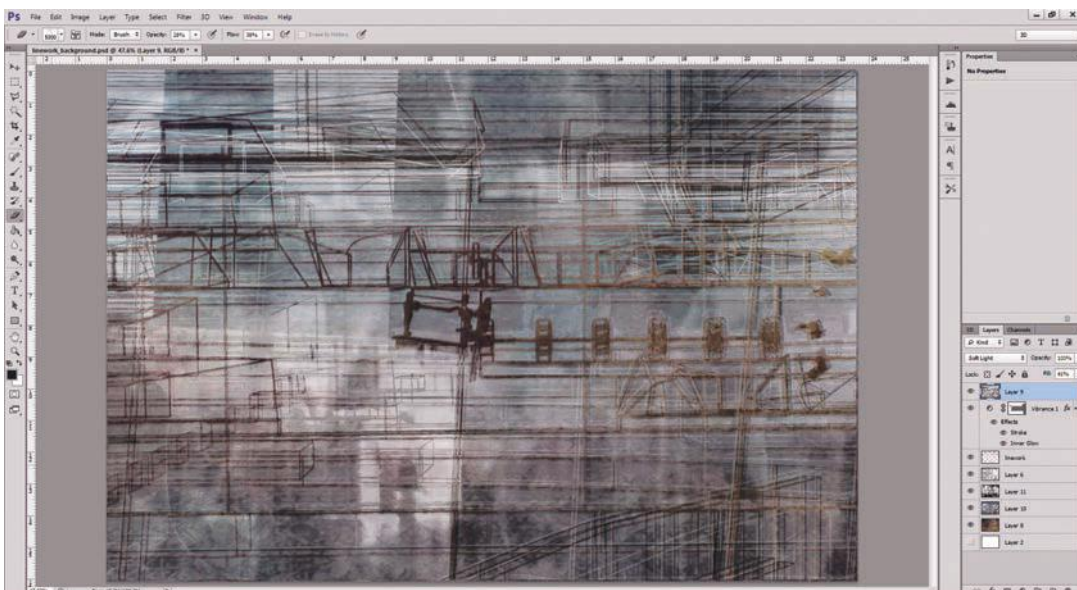
7 The Adjustment Layer's mask is refined with the options available in the Properties panel.



8 The final adjustments are made in the Properties panel by changing the Density and Feather values. The Opacity is then lowered to 37%.

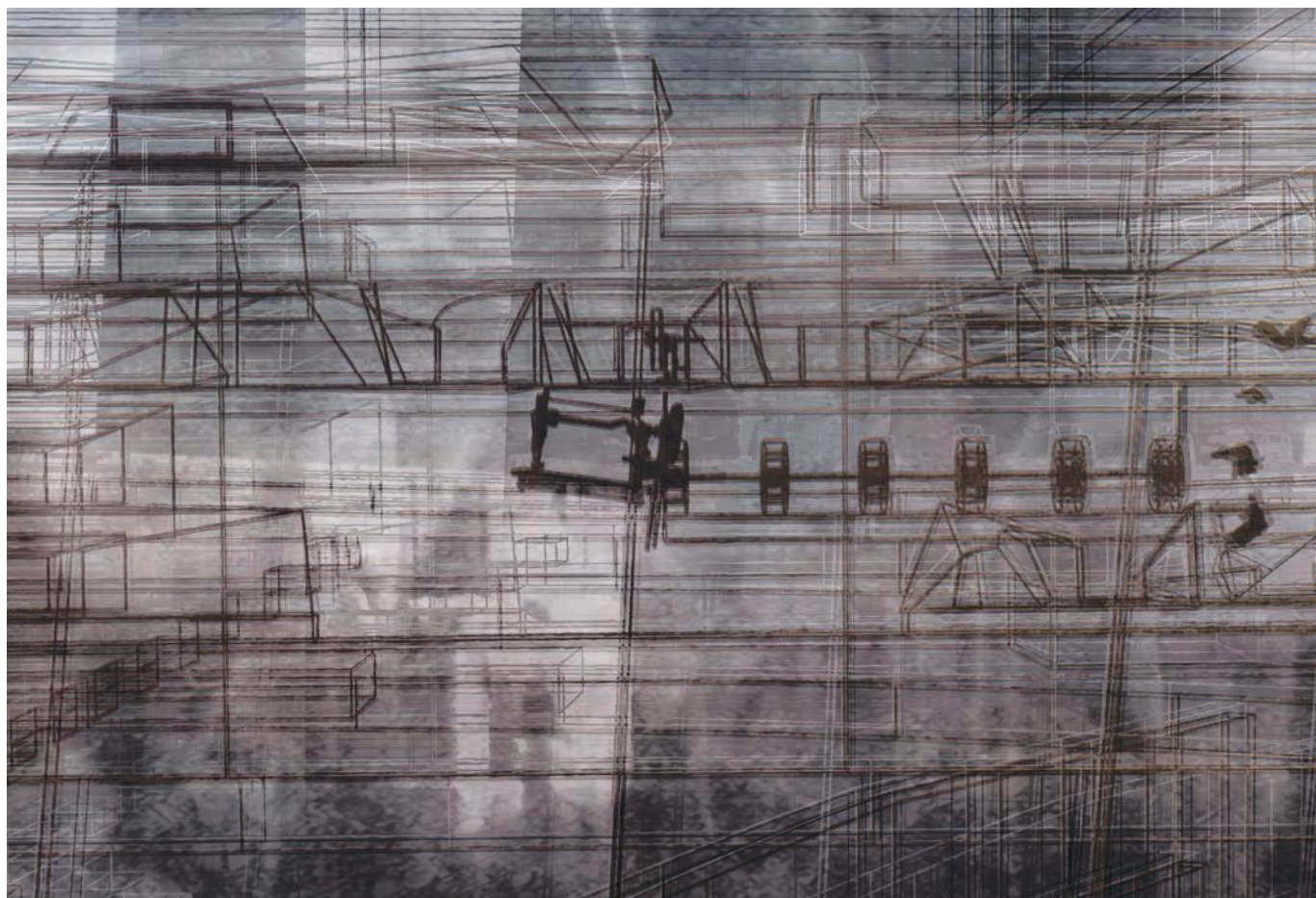


9 The original line drawing is then placed in the file, and the part intended to be emphasized is inverted.



10 The custom Eraser is then used on the top layer, with varying depth values each time.





11 The final drawing.

## Render

Drawings are the first stages of making. Architectural drawings, as artefacts, evolve to describe light, colour and material surface. 'Rendered' drawings are vital, intermediate stages between the creative imagination and built space. Collections of lines can describe light and shadow; areas of colour, texture and even material fragments can, collage-like, bridge the gap between strategic thinking and material realization. Rendering transforms an abstract drawing; light, texture and colour, both real and fictive, combine to speak of a possible materiality and give a concreteness to the imagined place.

Rendering of this kind is often partial or incomplete. Like a half-finished sketch, the resulting image bears an openness that is as engaging to the viewer as it is integral to the creative design process. This kind of rendering is a natural extension of the line drawing as a process of thinking: exploratory drawings, and to a certain extent sketch models, uncover ways to engage with craft, making and processes of fabrication. Later in the design process rendered drawings can clearly articulate ideas of material and light in order to facilitate detail decisions.

These kinds of rendered drawings are done as the design is in progress. By contrast, a 'final render' has long played an important role in the communication of an architectural proposal. Final renderings are often the most celebrated kinds of architectural drawings and have, through history, used a whole range of techniques. Early renderings ranged, for example, from precise pen-and-ink washes to tempera paintings to frescoes and oil-based



### Top left

Peter Sparks' simple pencil and watercolour sketch brilliantly captures the scale, light and materiality of the streetscape. This kind of sketch requires careful adjustment of the amount of water on the page to vary tone between washes and sharp edges.

### Left

Sound Travels, Archi-Tectonics. This study shows how effectively form can be described using line, light and shadow alone (for another image in this study, see page 24).

paintings. Later, techniques such as watercolour, charcoal and pastel facilitated a more expressive rendering of light, detail and material surface. These images were originally the work of artists and illustrators, but more recently techniques have moved away from such hand-rendered 'artists' impressions', through collage and photographic montage, to computer-generated images (or CGIs).

CGIs vary in character and complexity but this technique is now used for the vast majority of contemporary architectural renderings. More often than not the final image is made by working in a number of different software packages. Invariably these programs support a formal imagination and are at their best when describing complex forms, structural detail and photorealistic lighting that would otherwise be difficult to represent.

On the one hand, the photorealism of CGI is something relatively new and, using a handful of software packages, the super-realistic render has become a global standard. On the other hand, however, these drawings can often be less than convincing; somewhat formulaic and even unnerving in character. They are not the 'intermediate drawings' that are integral to the creative design process; rather they have a more authoritative character all of their own that represents the building with unerring certainty. Ironically, although graphically almost anything has become possible, there is, at the same time, a level of predictability that means that even the most sophisticated renders can resemble illustrations that lack the engaging capacity of richer drawing forms. A modest idea can appear super-real and well-trying visual effects can supplant architectural intention.

Rendering is underpinned by an understanding of chiaroscuro, or how light and dark structure a drawing so as to find and define form, and also to build depth into an eventual colour or tone. In architectural drawing the discipline of 'sciagraphy', or shading in drawings, is the touchstone of many, if not all, representational techniques.

On the following pages two works by the artist Anne Desmet, *Domus Aurea II 1991* and *Poolside Reflection*, explore the play of light in space with a particular assuredness. The effectiveness of Anne Desmet's work lies at least partly in her imaginative use of technique and the way in which it connects to the content of the spaces depicted. The purpose of these rendered artefacts is to capture the viewer's imagination; a drawing is there to be explored rather than merely to illustrate; to trigger ideas rather than merely narrate.

The 'presence' of a drawing will in part be a question of content and formal arrangement on the page, but it will also hinge on the way in which the drawing itself is actually made: the material qualities of its surface, its textures and depths. While modern

digital techniques tend to reduce surface depth, traditional techniques fundamentally depended on it. Exploiting the properties of natural pigments to have different levels of transparency, media such as tempera, oils and watercolours all work with 'layers' or 'glazes' to create an impression of surface depth. Sometimes almost imperceptible effects – such as the presence of Armenian bole underneath a gilded surface – are part of the way representation has, until recently, captured the imagination of the observer through an investment in surface and light.

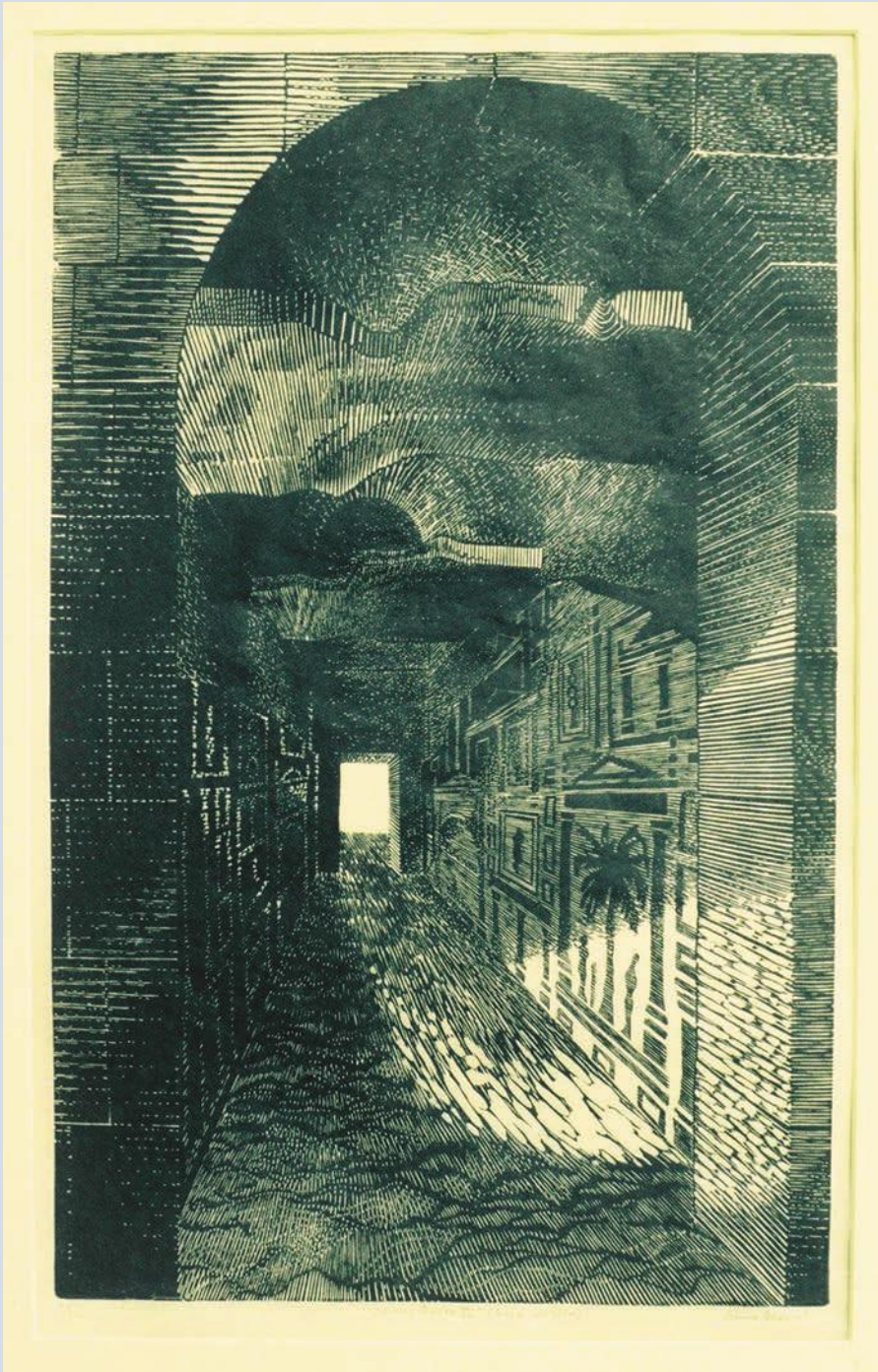
Computers present us with a large range of rendering tools and software. These range from basic modelling packages like SketchUp that incorporate an ability to render walls and lighting, to more sophisticated software, like modo, V-Ray or 3ds Max, which is specifically designed to render models efficiently, dealing with complex texture, incident and radiant light.

Photorealistic computer renders are often the result of working across software packages and can be a lengthy process. It can also be useful to develop sketch models digitally that are more quickly 'rendered'. In this sense SketchUp is a popular and useful tool. It is precise as well as being quick to use. Vector drawings from most platforms can be imported and the models can then be exported into additional rendering packages if necessary. Within SketchUp itself are useful guides to sciagraphy, material palettes and components; within Layout, orthogonal drawings can be quickly set up from the sketch model.

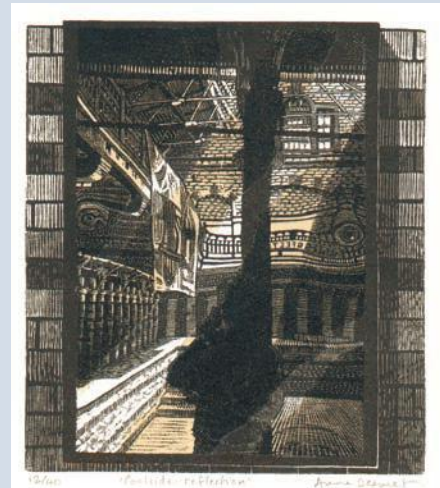
Photoshop also remains a vital tool that enables architects to create a vivid impression of a proposal. Photoshop layers can be quickly mapped over views of basic models to effectively represent ideas and take designs forward. The featured interior of 'Revolution Manchester', for instance (see page 35), was rapidly put together in Photoshop as a rudimentary collage over a basic model done in Rhino. This preliminary drawing initiated a design discussion, rather than being a final render. The drawing used obvious Photoshop tools that transform and warp material textures, demonstrating that this program, like other digital tools, is equally effective when it is used with restraint.



## Case Studies: Render



1a



1b

1a. Printmaking is a rich medium for architects to discover the effective use of light and dark. The artist and printmaker Anne Desmet brings a deep understanding of the subject into her architectural works. Here, for instance, is *Domus Aurea II* 1991, a linocut printed in blue/black ink on off-white Japanese Kozu-shi paper. It was developed from tiny pencil and grey wash sketchbook drawings made from memory of the now-underground Golden House of Nero in Rome. It was not intended to be an accurate representation of the interior but more an evocation of some of the light effects, flashes of fresco detail and a sense of the cavernous space, silent abandonment and inky darkness.



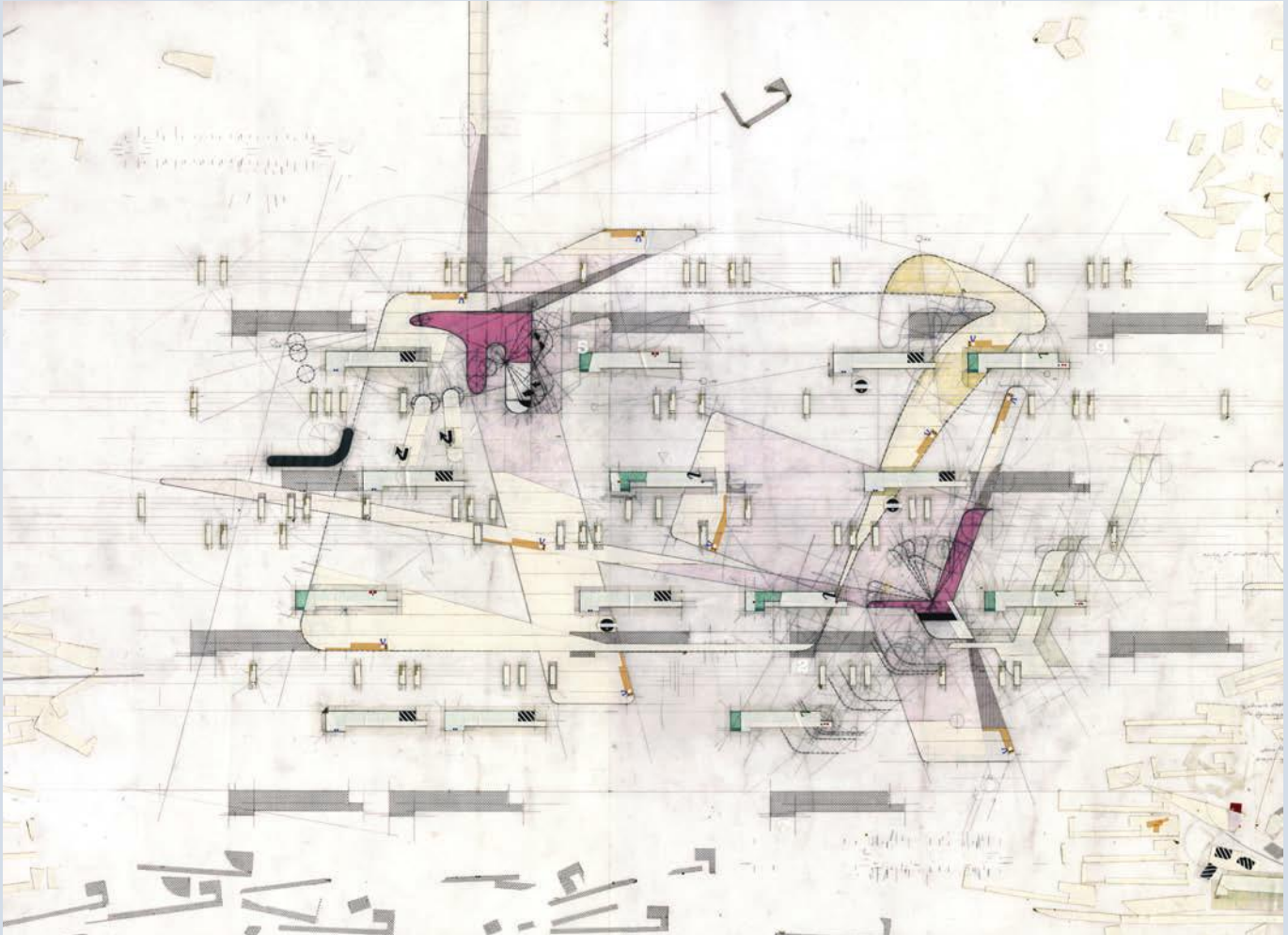
2

1b. A second image by Anne Desmet, *Poolside Reflection*, is inspired by the interior of Manchester's Victoria Baths. It is a wood engraving and Chine-collé, printed in black ink. In the cutting of the block, the artist enhanced and exaggerated various light effects observed in the reflected mirror seen in the building and in the photographs. The mirror in question was dented and discoloured, creating a distorted reflection that the artist has exaggerated in her engraving to suggest the effects of reflections in pool water, in former times when the baths were in use. The Chine-collé areas of the print (the buff-coloured paper sections) were added to give a sense of the mirror being a different colour and texture to the wall on which it hangs. The pattern of light and shadow underscores the tonal effect of the Chine-collé to create a sense of the spatial and material conditions of the derelict baths. The abstraction of the mirror-like surface of the drawing engages the imagination and opens

up associations that move between light and structure to glazed surfaces and rippling shadows to create an impression of an aqueous world that remains long after the baths have closed.

2. A number of contemporary rendering techniques are best understood as a process of layering. The simplest of these is pencil and coloured crayons. The potential of these techniques is brilliantly demonstrated in the drawings of Eric Parry, one of which, *Elevational Studies for Old Wardour House in Wiltshire*, is illustrated above. This sequence of elevations, drawn at a scale of 1:50 in pencil, is delicately balanced between precise, ruled line work, freehand lines and hatching and layered pencil crayon. Together, the simple techniques convey both material and modelling of the building's surface. The drawing is delicate in its execution, but also underpinned with precision, and represents a real sense of the architect's understanding of material, making and landscape.



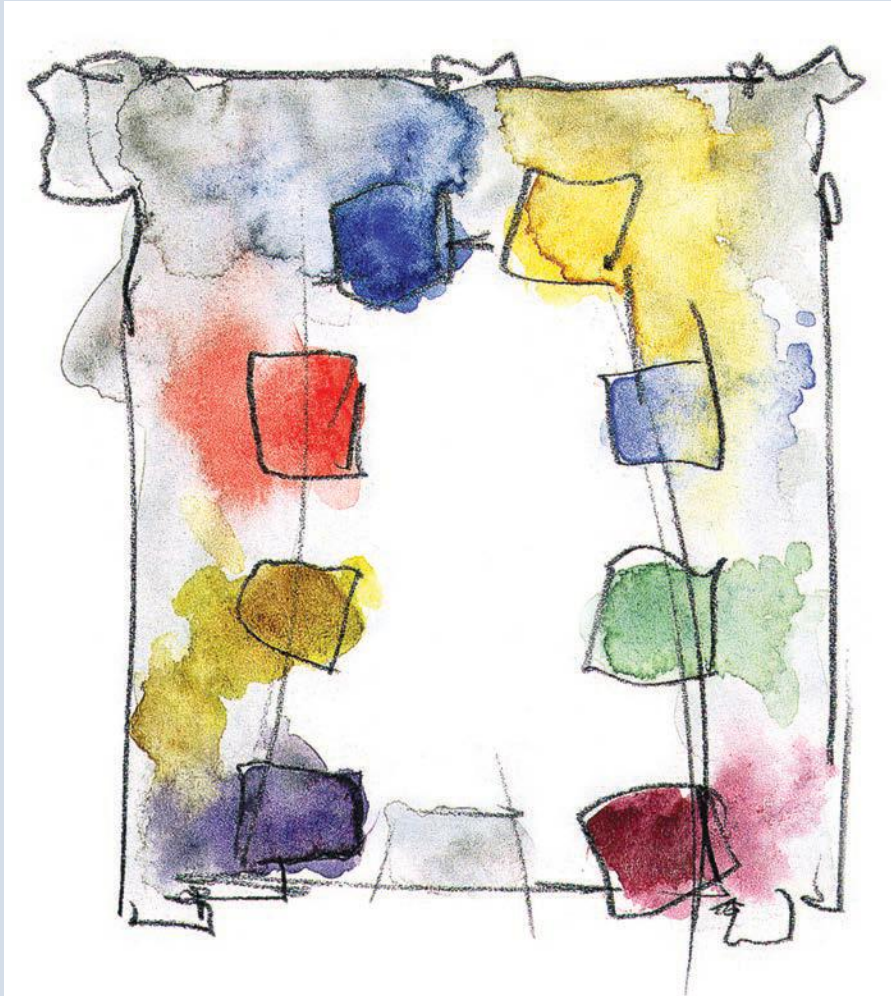


3

3. Perry Kulper develops pencil drawings with a similar refinement to Parry, using line weights of different kinds, and a depth that comes from working on both sides of the drawing film. In this drawing, his line technique is extended to become a more tonal field. The rendering has a flat, graphic quality that contrasts with a more ambiguous reading of overlapping spaces that move across the page. Around the middle of the image the density of the tone increases to establish a space comprised of primary and secondary layers. These are distinguished using different tones. In the background is a light crimson-madder that reads almost like a shadow. In the foreground are more specifically defined shapes, rendered in Naples yellow, and between the two floats a rhythm of grey zones, like elements of structure, made from transfer adhesive tone and occasionally highlighted in white. Finally two crimson-pink elements grow out of the lower shadows and appear to

generate an array of other lines and movements. Kulper uses a combination of tonal render and differential line weights to initiate a wonderfully alive spatial dynamic across the page. Relative values of colour and light open and close shapes and movements, like collages of fragments of plan and section to form a composite relief.

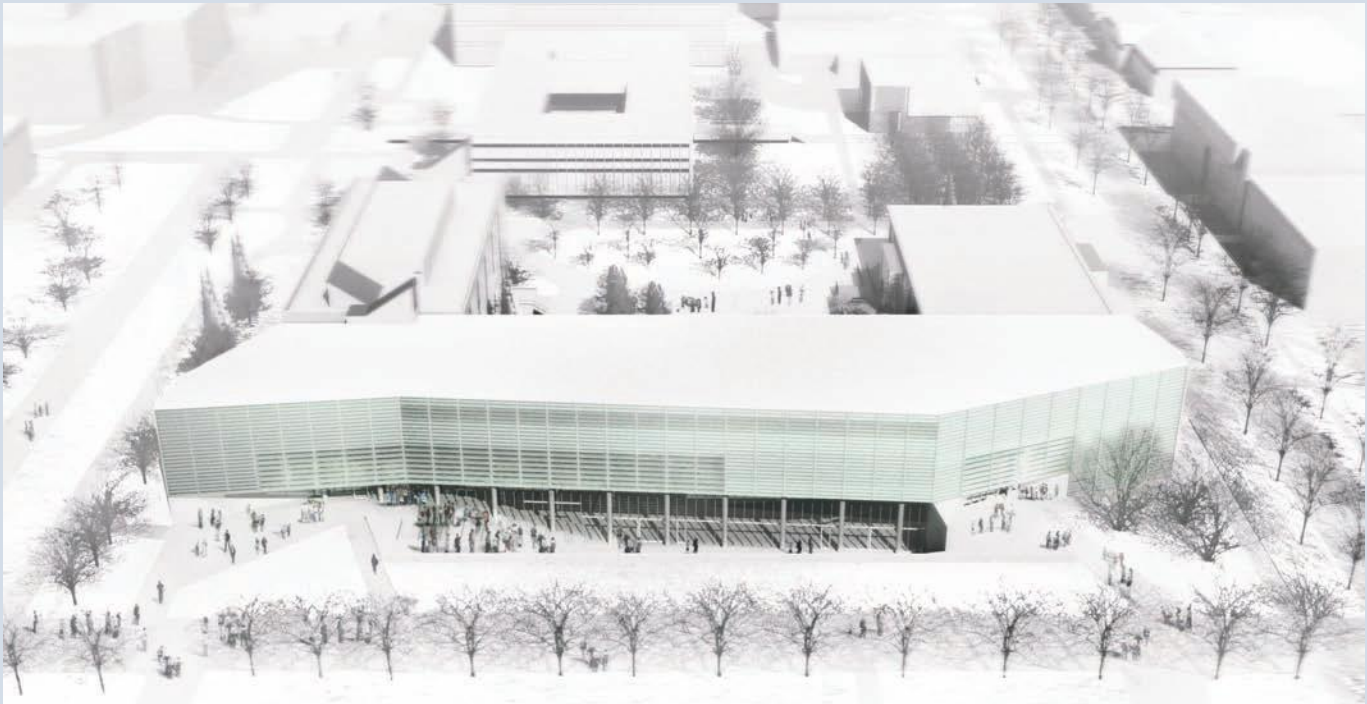




4

4. Watercolour, though often associated with smaller observational or illustrative renders, is among the most expressive of techniques and applicable to drawings of all scales. In a watercolour the translucent layers allow the luminosity of the page itself to emerge; light travels through the layers of coloured glazes, is reflected off the page and animates the image. The vibrancy of a watercolour comes from this play of incidental and reflected light within the microscopic depths of its surface. Like ink, watercolour is a challenging technique and depends on a precise control of surface and brush-held water. Here, a rapid sketch by the architects Moore Ruble Yudell represents a plan arrangement. Like most watercolours, the drawing is first mapped out in soft pencil and then liberally coloured, using water in such a way as to encourage the colours to run into each other. Deliberately leaving the paper surface wet in this way gives the impression of both pencil

and colour coming together to represent this conceptual arrangement.

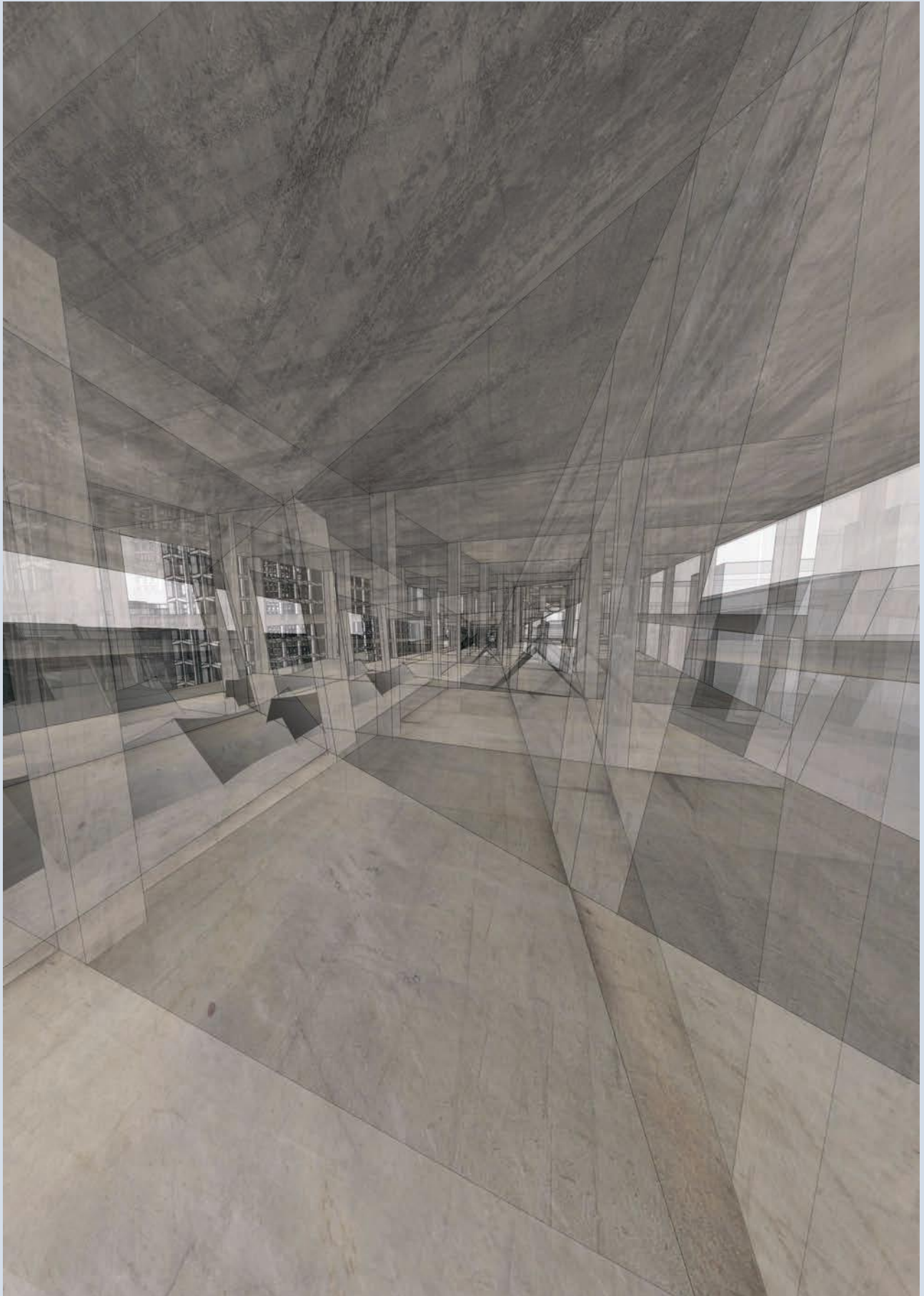


5

5. This aerial perspective of the Centre for Music, Art and Design, University of Manitoba, Canada, by Patkau Architects is characterized by tonal restraint. The sense of depth in this drawing is in part created by the perspective structure, in part by the selective use of colour and detail in the foreground and then the gradual shift to an out-of-focus image in the background. The understated rendering gives the drawing impact; line and monochromatic drawings can be as powerful as a full-colour photographic render. What is important is that rendering is perceived as a creative and integral component of the process of reflective design thinking, not a simple mechanical application of a software product or technique. Here the level of rendering is particularly well judged, bringing out simple form, façade detail and the broad relationship of the building to the landscape and the overall topography of the city.

6. This drawing, by Yakim Milev, is a study for a project for the refurbishment of Centre Point in London. A two-point perspective, suggested by the building's existing structural grid, was the basis for the image. The perspectival effect was emphasized by four separate camera shots with a different lens length (45, 35, 25, 15mm) in Photoshop. The dark tones were brought through the upper layers of the drawing to strengthen the structural rhythms of the building. A model was created as a wireframe in Rhino, and the only texture used was

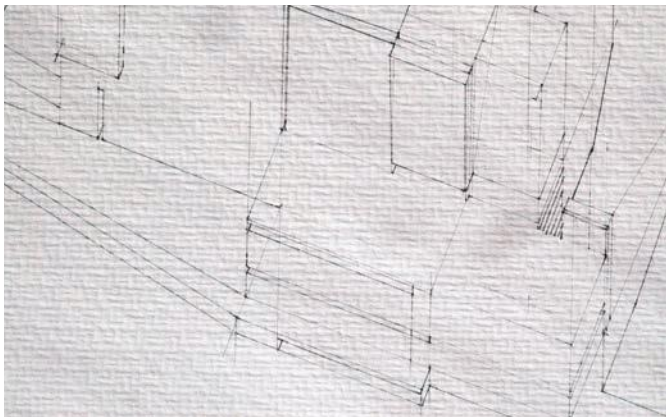
a photograph of a concrete wall. All other objects use generic Rhino materials with 0% transparency, gloss and reflectivity. This is primarily due to the complexity of the model. After superimposing layers, the image was flattened with Brightness/Contrast adjustments in order to extract more detail from the texture of the concrete, and to emphasize, through the intensity of the light, the directional nature of the space. Finally, the image was converted to CMYK mode in order to see accurately how it would look when printed.



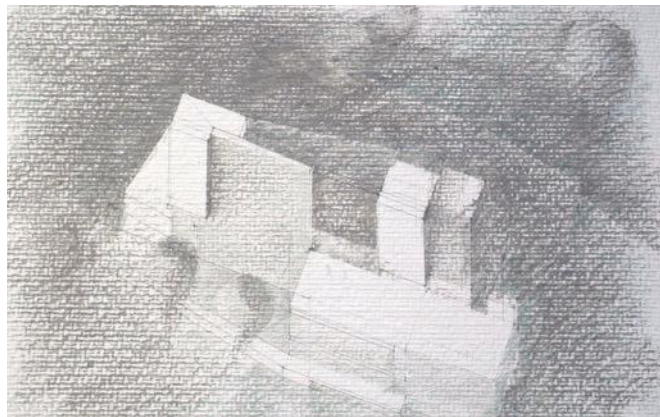


## STEP BY STEP PENCIL CRAYON

Drawings 1 to 6 are of a sketch study of a garden structure in pencil crayon. It was a developmental drawing in the sense that the design was initiated and developed by working through the drawing.



**1** An initial sketch study for a garden structure is sketched out by hand using a sharp, F-grade pencil. In this detail you see how the lines are feathered at each corner and how construction lines are left visible. It is important to reduce the amount of erasing, as this compromises the paper's surface quality.



**2** Crayon is best built up in layers to create a depth to the eventual colour. It is most effective if shading is done in one direction. The first layer is in Silver Grey and this should lightly cover the entire surface of the drawing with the exception of any areas that are to be left white. The next layer is French Grey that should establish a mid-tone for all surfaces, slightly lighter or darker depending of areas of shadow. Conventionally, the lower the land, the darker the shadow in plan, and water is very dark.



**3** Gunmetal and then a blue-grey crayon are used for the areas in shadow. The form and shadow of vegetation is laid in. Earth tones are added to the landscape, which become too dark and are subsequently lightened with a putty rubber. The areas most in shadow are rendered using Burnt Crimson.

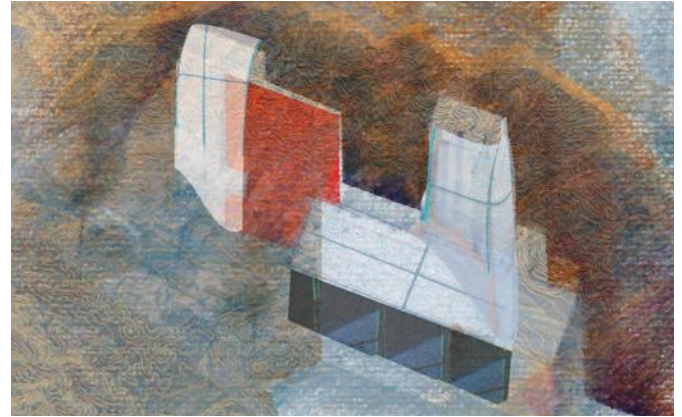


**4** Golden Brown lightens the ground planes and Burnt Crimson sends others into deeper shadow. The foreground is lightened with Silver Grey and Chinese White.





5 Further depth is built into the landscape, leaving the sketch drawing incomplete and unresolved at this stage.



6 Photoshop then balances ideas that were initiated in the hand drawing in order to finalize this stage of the design with more clarity.



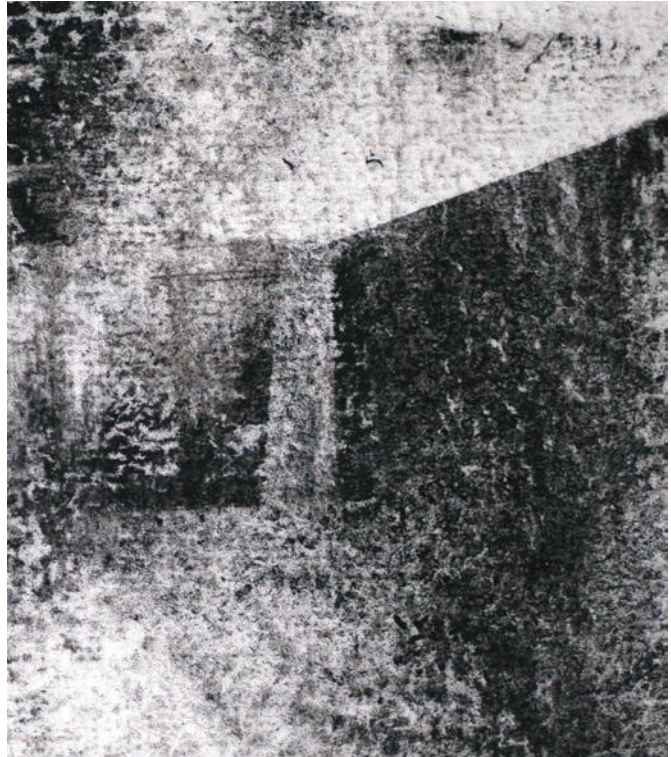
7 The final image remains sketchy – the process is a study rather than an illustration of a final design. This stage introduces a foreground tree (using the Magic Wand tool to quickly trim and the Transform tool to resize). The Pen tool is used to draw the shapes that make the foreground shadows.



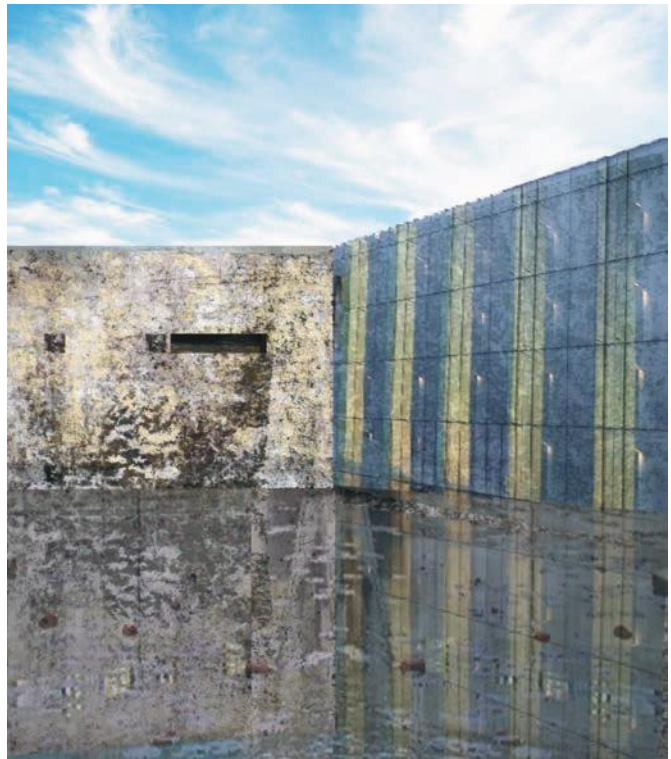
## STEP BY STEP CHARCOAL

These sketch studies are intended to investigate the versatility of charcoal for exploring a variety of ideas and situations. In each of the drawings charcoal is used to explore shadows, establishing form and landscape in terms of chiaroscuro. A textured surface acts as a key for the soft charcoal. Darks are laid into the surface and then removed with a putty rubber in a process that is akin to sculpting clay.

- 1 This sketch uses the edge of a soft willow charcoal. It is a sketch for a garden room, enclosed but open to the sky. The sharp contrast in tonality between the wall and the sky was formed by rubbing some of the charcoal powder against the edge of a piece of paper. Rubbing out with a putty rubber forms other sharp contrasts in the same way.



- 2 The sky is masked and a water layer added using the Photoshop Pen tool.



- 3 This is the finished sketch, developed as a simple collage in Photoshop. The underlying textures of the initial sketch remain, making the final image less predictable.





1 This sketch was done using willow charcoal, one of the most sensitive drawing tools, responding to the lightest of touches. It shows an interior looking towards a window opening.

2 Using Pen and Masking tools in Photoshop, add floor texture and window detail. Develop figure with Motion Blur to indicate scale.



3 The final image is further developed using lighting effects in such a way as not to lose the material qualities implied in the original charcoal drawing.



1 This rapid sketch is made with the edge of a harder, compressed charcoal. It is a preparatory study for a garden niche. The combination of this dark charcoal with textured paper is ideal for conveying the kind of material surfaces associated with garden settings.



2 Transparent layers of colour are added in Photoshop as a quick way to explore more detail and a reflective, aqueous floor to the space.

## STEP BY STEP WATERCOLOUR INTERIOR SKETCH

The key to a successful watercolour is retaining the luminosity of the paper. Working from the light of the surface, watercolour involves a process of adding translucent washes, working from light to shadow, to create layered colours and depths. In this way the light is always retained in the image. More than anything else, watercolour requires the ability to control the water content in the brush and on the page at every stage.

The following colours are useful for architectural drawings:

- Oxide of Chromium, Cobalt Green, Windsor Green (Yellow Shade), New Gamboge (Gomme Gutte), Yellow Ochre, Naples Yellow, Gold Ochre
- Light Red (Rouge Anglais), Burnt Sienna, Raw Umber (natural), Sepia, Caput Mortuum Violet, Van Dyke Brown

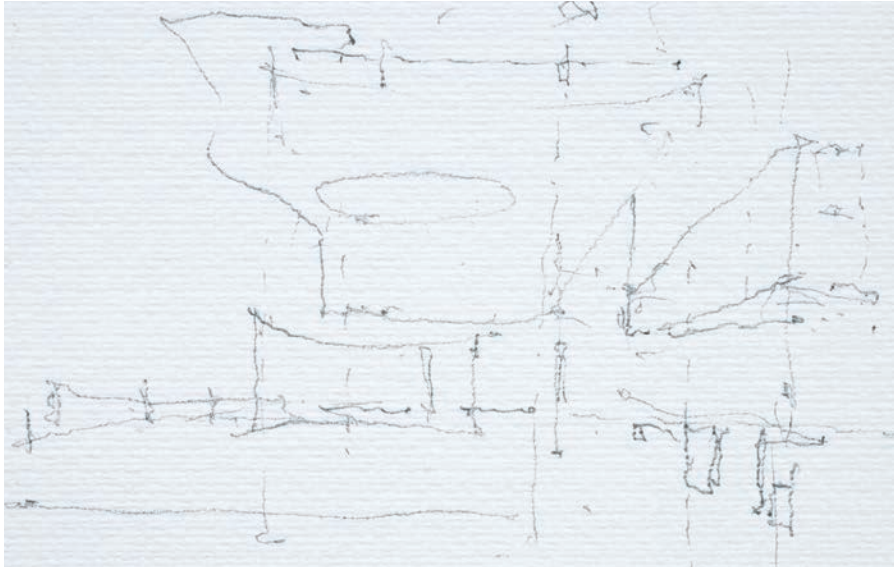
- Permanent Alizarin Crimson, Cadmium Scarlet, Madder Lake Deep
  - Prussian Blue, Delft Blue, Ivory Black, Payne's Grey
- Although not strictly necessary, white (or a white gouache for its opacity) is often used to add highlights when finishing a drawing and where the paper has been obscured.

Watercolour has traditionally been the rendering medium for final illustrative drawings. However, it also lends itself to exploratory design, and here are three exploratory sketches using watercolour.

This sequence of three images illustrate the process of making a quick sketch interior study.







- 1 First a pencil study roughly maps out what is known about the interior in terms of scale and primary openings.



- 2 The image is painted over liberally with a light glaze of Raw Umber and Sepia.



- 3 Detail and reflections are added in Photoshop.

#### TIP LAYERING COLOUR

Work colours in layers, from lights to darks or vice versa, depending on the technique you are using and the transparency of the medium.



## STEP BY STEP PHOTOSHOP

### FINISHING A COMPUTER-GENERATED IMAGE (CGI)

The following three sequences created by Ian Henderson demonstrate techniques for manipulating CGI images, creating shadows and colour-correcting images in Photoshop.

- 1 Clay model render is used to check composition of view, lighting and model accuracy.



- 2 The model is textured and rendered in a 3D application. The render is saved as either a .tiff or a .png file to preserve transparent areas of the scene.



- 3 Double-clicking on the Background layer releases it in order for it to function like a standard layer. Rename the layer. Drag the sky image into the working document and place it behind the Buildings layer.





- 4 To lift buildings from the sky, create a new layer and position it between the Buildings and Sky layers. To create the haze, the Gradient tool is used. The gradient is from white to transparent and the layer is given 50% opacity.



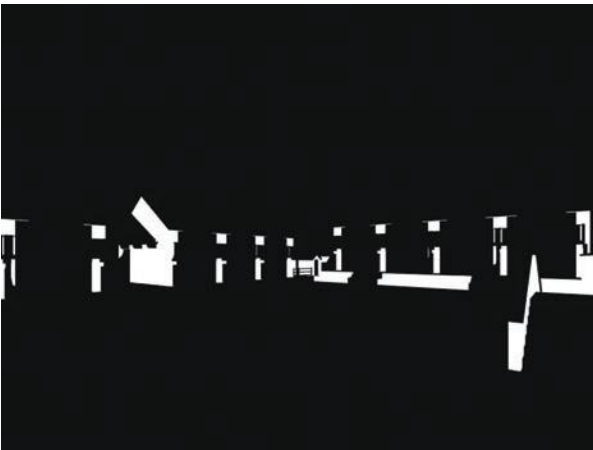
- 5 Trees are added on a new layer and positioned with the Move tool. The Trees layer is placed behind the Buildings layer in the background but above the Sky and Haze layers.



- 6 Create two new layers, one for Tree Highlights and one for Tree Shadows. Select the trees by Ctrl-left-clicking on the Trees layer (Ctrl-left-clicking on a layer will select everything on that layer). With the selection still active select the Tree Highlights layer and, using a soft brush, paint the tops of the trees white where the highlights would appear. With the selection still active, select the Tree Shadows layer and, using a soft brush, paint the bottoms of the trees black where the shadows would appear.



- 7 Soft Light layer blend is applied to both the Tree Highlights and the Tree Shadows layers with 75% opacity.



- 8 Grass texture is dragged into the working document using the Move tool (holding down Shift while using the Move tool will centralize the imported image to best fit the receiving document). With the Grass layer selected create a duplicate layer (Ctrl-J). With the Move tool position the Duplicate layer adjacent to the original Grass layer. Merge down the Duplicate layer with the Grass layer.

Repeat the duplication of the Grass layer until it is at least twice the size of the foreground grass.

Apply perspective to the Grass layer to match the grass in the image using the Perspective and Distort functions of the Transform tool (Ctrl-T activates the Transform tool. While it is active, right-click to access the different transform functions.)

Select the foreground grass using the Polygon Lasso tool. (Holding down Shift when using the Polygon Lasso tool will constrain the lasso horizontally, vertically and at 45 degrees. While using the Polygon Lasso tool, Backspace will undo the last click. The spacebar will permit panning around the image during the Polygon Lasso tool's use.)

With the selection still active and the Grass layer selected, create a layer mask to hide unwanted areas of the Grass layer (if a selection is made and a layer mask is created it will adopt the selection as the mask. Layer masks allow parts of the layer to be hidden or revealed by painting with white, black or grey. White equates to 100% opaque, black equates to 0% opaque and the shades of grey in between equate to varying levels of opacity.)

- 9 Various layers are created and named to form shadows and highlights on the grass. Black is used for shadows and white is used for the highlights. Each layer is given a different opacity and layer blend depending upon the result required.

- 10 Create an alpha channel by rendering a black and white image of the scene from the 3D application. The white isolates a particular material (in this case the stonework) and the black indicates the rest of the model. Drag the alpha channel into the working document and place it at the top of the layer stack. Load the alpha channel as a selection (Ctrl-left-click on Layer).

On the Channels tab save the selection as Stone alpha channel.

- 11 From the Channels tab load the saved Stone alpha channel as a selection. Create a new layer and rename it. Fill the selection with white using the Fill tool (Ctrl-Backspace will fill a selection with the background colour and Alt-Backspace will fill the selection with the foreground colour).





- 12** With the new White layer selected apply a Soft Light layer blend and set the opacity to 25% in order to lighten the stonework.



- 13** To change the colour of the stonework select the required colour and create and name a new layer. From the Channels tab load the saved Stone alpha channel as a selection. Fill the selection with the required colour. Apply a Darken layer blend and set the opacity to 20%.



- 14** Load the Grass alpha channel from the Channels tab as a selection. Remove the part of the selection that covers the foreground grass leaving only the background grass area selected. Create and name new layers as required to colourize the grass and provide shadows and highlights using the techniques described above.



- 15** Create a new group in the Layers tab and rename. Drag, drop and position trees as required into the new group within the working document.



- 16 From the Channels tab load the 'sky alpha channel' as a selection. With the 'trees group' selected create a layer mask (this will put a layer mask on the group, and therefore the layer mask will affect all the layers within the group). Left click on the layer mask to ensure it is selected and refine the layer mask by painting with black and white to ensure the trees are revealed in the correct areas ('x' will toggle between the foreground and background colours, which helps speed up editing process. To view the layer mask, alt-left-click on the layer mask and repeat alt-left-click to return to view layer. Layer masks can be edited or refined in both 'layer mask view' and 'layer view').



- 17 Create a new group in the Layers tab and rename. Drag, drop and position elements to be reflected in the windows (i.e. sky, trees, bushes, people and so on) into the new group within the working document. From the Channels tab load the 'reflection alpha channel' as a selection. From selection create a layer mask on the 'reflection group'. Refine the reflected elements using the techniques described above.



- 18 Drag, drop and position foreground vegetation. Manipulate vegetation to adhere to perspective and scale using the Transform tool set. Use layer masks as required.



**19** Create a new group in the Layers tab and rename. Drag, drop and position people. Manipulate people to adhere to perspective and scale using the Transform tool set. Note the direction of the lighting on the people and ensure that it corresponds to the lighting in the scene. Make sure that people sit well in the scene by colour-correcting using image adjustments and/or layer adjustments (levels, curves, hue/saturation, photo filter and so on). Create shadows for people, ensuring that they are cast in the correct direction with regard to the lighting in the scene.



**20** To encourage the eye towards the centre of the image, create a new layer and rename it. With a large soft brush, paint a black border (when using the Brush tool, hold down Shift to draw a straight line between two points).

**21** To finalize the image, apply a Soft Light layer blend to the black border and set the opacity to 25%.





# STEP BY STEP PHOTOSHOP

## CREATING SHADOWS FOR PEOPLE



1



2



3



4



5

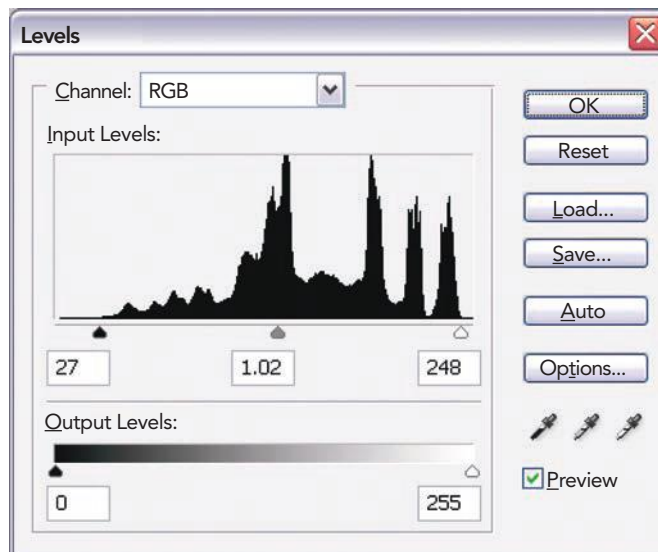
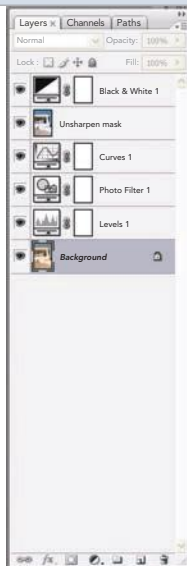
- 1 Separate figure: make sure the image of the person is on its own separate layer and is named.
- 2 Create black silhouette: duplicate the Person layer and rename it (Ctrl-J duplicates a layer). Open the Hue/Saturation dialogue box (Ctrl-U). Move sliders for both Saturation and Lightness all the way to the left so both have a value of -100.
- 3 Distort silhouette: select the Shadow layer and activate the Transform tool (Ctrl-T). Right-click over the image and select the Distort function. Grab the upper middle anchor point and move it into position. Double-click to apply changes, or hit Return. In the layer manager drag the Shadow layer so that it lies beneath the Person layer.
- 4 Apply transparency: ensure the Shadow layer is selected and set opacity to desired level.
- 5 Apply Gaussian Blur: depending upon the type of shadow required, a Gaussian Blur filter can be used to soften the shadow.

# STEP BY STEP PHOTOSHOP

## COLOUR-CORRECTING A PHOTOGRAPH

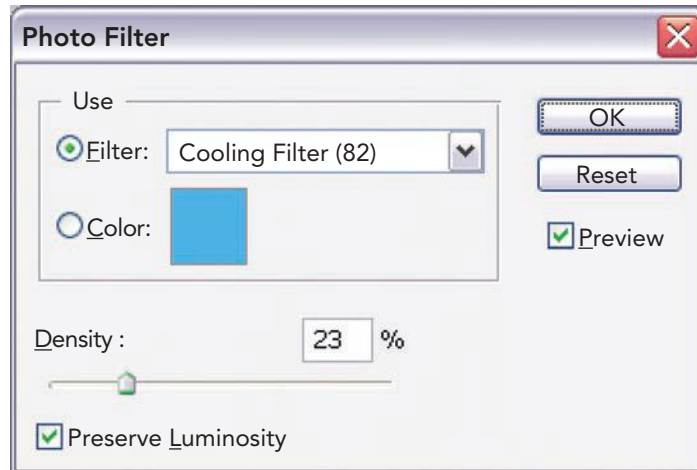
### TIP LAYER ADJUSTMENTS

Layer adjustments, as opposed to image adjustments, are made because they provide a non-destructive workflow and can be re-edited or turned off at any time. Each new layer adjustment is an additive effect, therefore fine adjustments may be required once all have been applied.

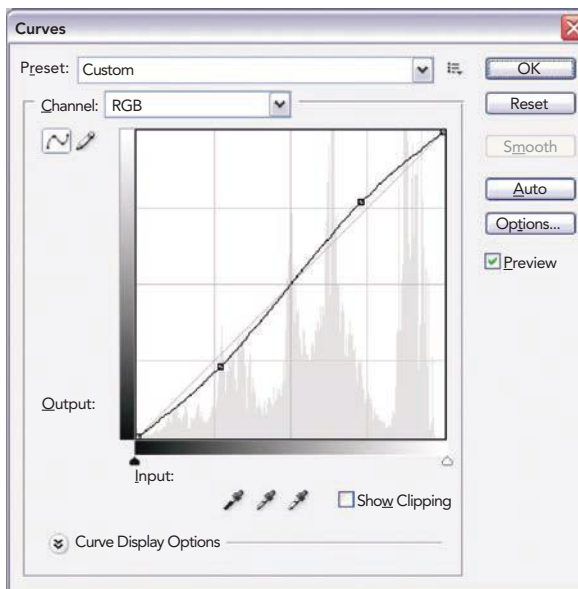


**1** The original photo has an orange colour cast and is slightly de-saturated. The Levels layer adjustment allows control over the light, mid and dark tones of the photograph. This can give the photograph more contrast and saturation, and therefore more punch.

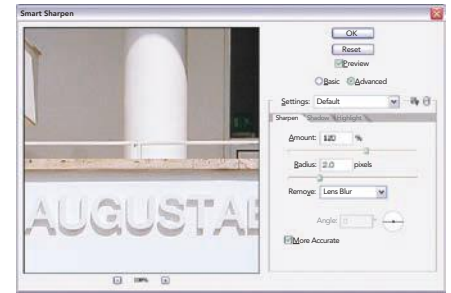
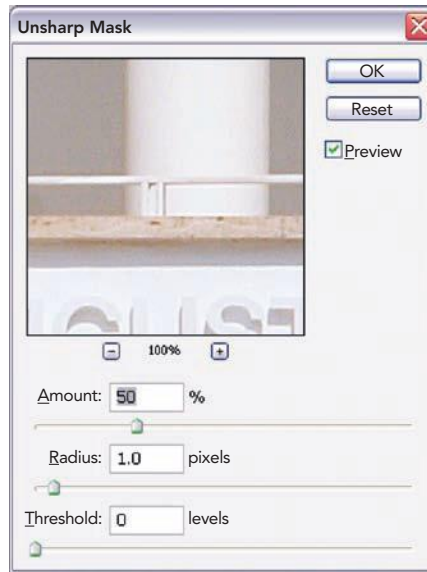




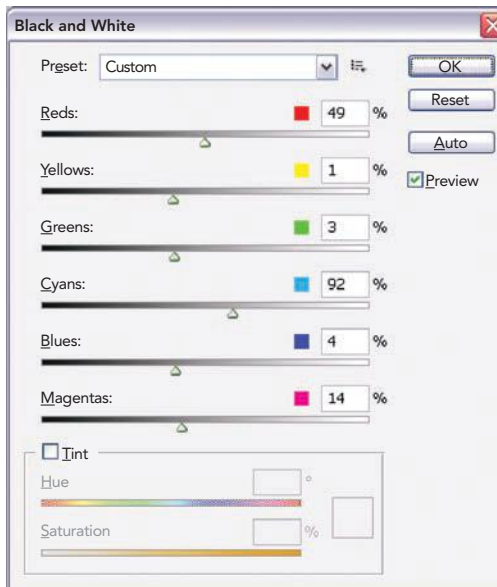
2 The Photo Filter layer adjustment allows control over the colour cast of the photograph. A blue filter is used to counteract the orange cast in the photograph.



3 The Curves layer adjustment allows control over the image, similar to the Levels layer adjustment. By adding points to the curve, the photograph can be adjusted in many different ways. For this photograph, an S curve is formed by adding and adjusting two points. This brightens the light tones and darkens the dark tones of the photograph and adds more contrast, saturation and punch.



4 Photographs from digital cameras are often very slightly soft and require careful sharpening. The Unsharp Mask Filter or Smart Sharpen Filter are both very good at achieving subtle sharpening. The Unsharp Mask Filter is easy to use and can yield very satisfactory results. The Smart Sharpen Filter is more sophisticated and requires more involvement but can yield excellent results. Any sharpening must be applied with care and a subtle touch.



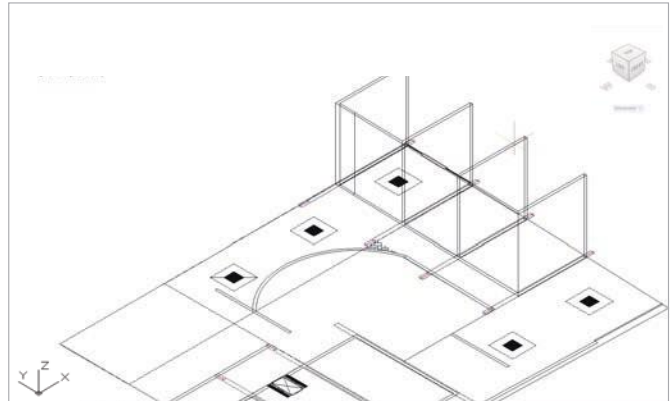
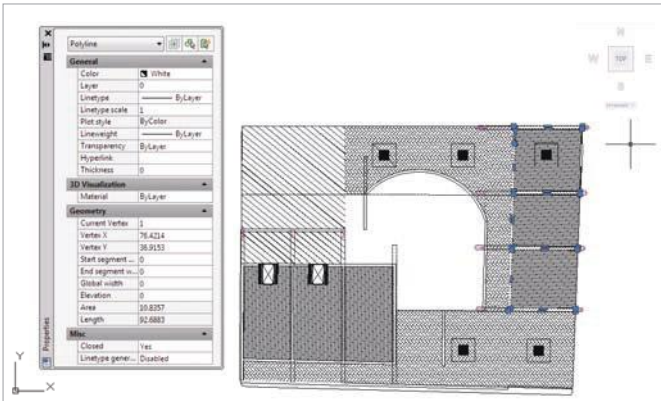
5 To convert your photograph into black and white use the Black and White layer adjustment. The Black and White layer adjustment provides full control over how each key colour group is converted into black and white. Therefore the options are limitless depending upon the effect required.



# STEP BY STEP AUTOCAD TO 3DS MAX

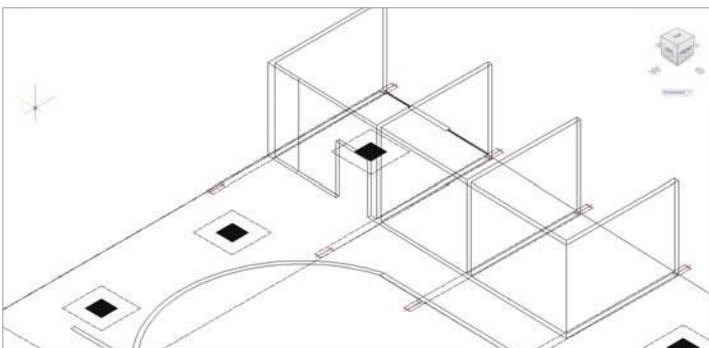
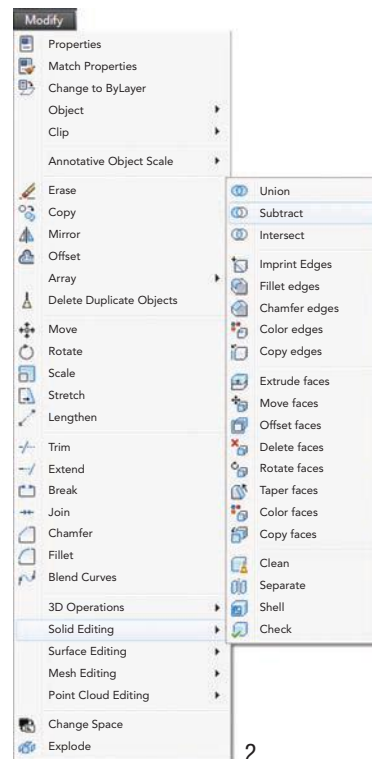
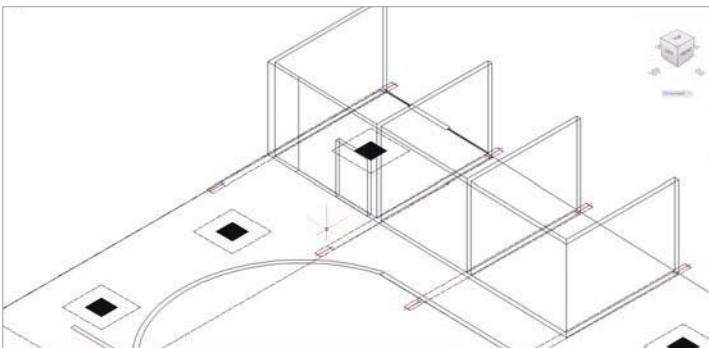
Most rendered drawings now use more than one software package. Hybrid drawings can fruitfully alternate between hand drawings and CAD. In this way, we can produce more personalized drawings rather than illustrating the tricks of well-known digital tools and effects. Here we illustrate one

possible process, selected to best simulate natural and artificial light, while using basic software packages. In the following sequence, architect Maria Vasdeki illustrates a way of testing the distribution of light in a space while making a three-dimensional model in Autodesk's AutoCAD and 3ds Max.

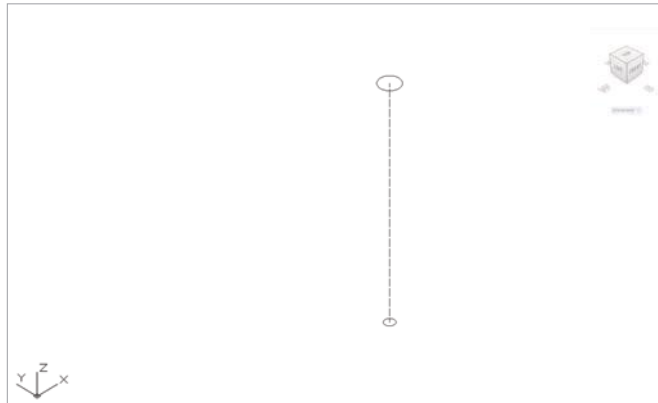


**1** The 2D plans are drawn in AutoCAD, using closed polylines for the objects that are to be carried onto the 3D model.

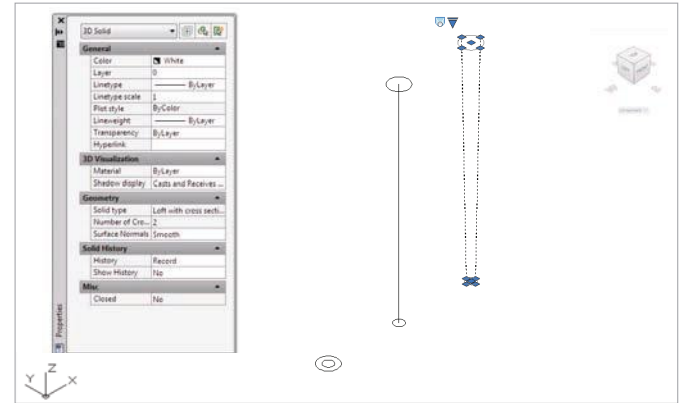
**2** These objects are made three-dimensional using the Extrude command.



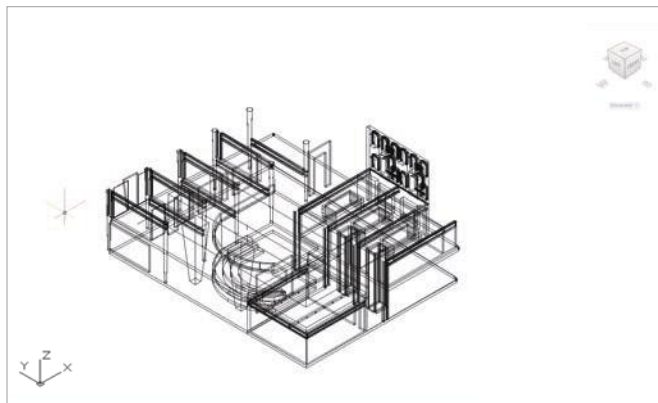
**3** Openings are made by creating separate solids (1) and then subtracting them (2) from the larger solid (3).



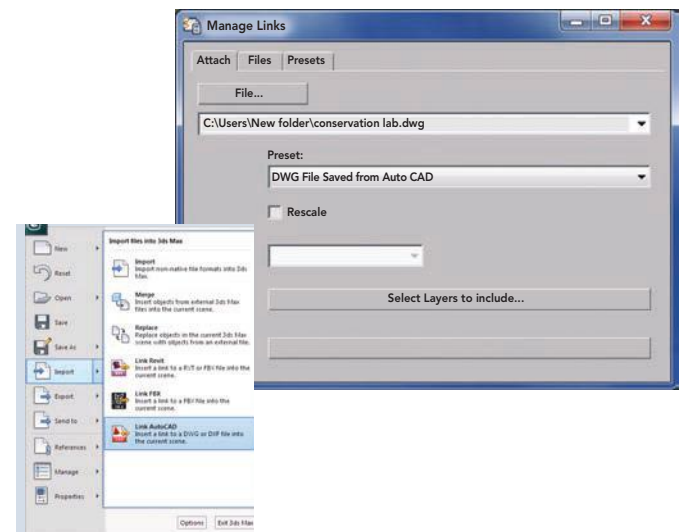
4 The columns are then made into 3D objects using the Loft command.



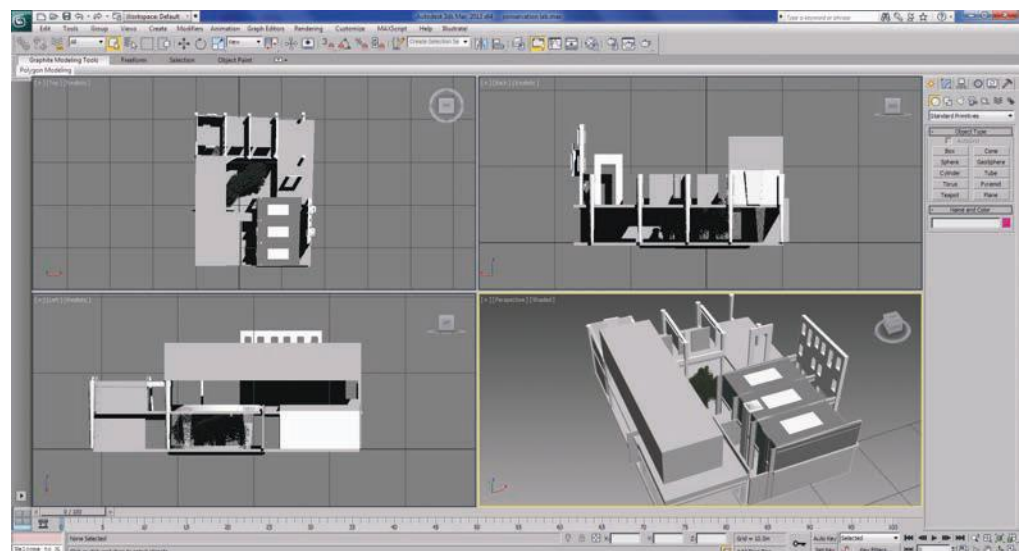
5 The Loft command uses two (or more) cross-sections, moved at the appropriate distances, to create a solid object.



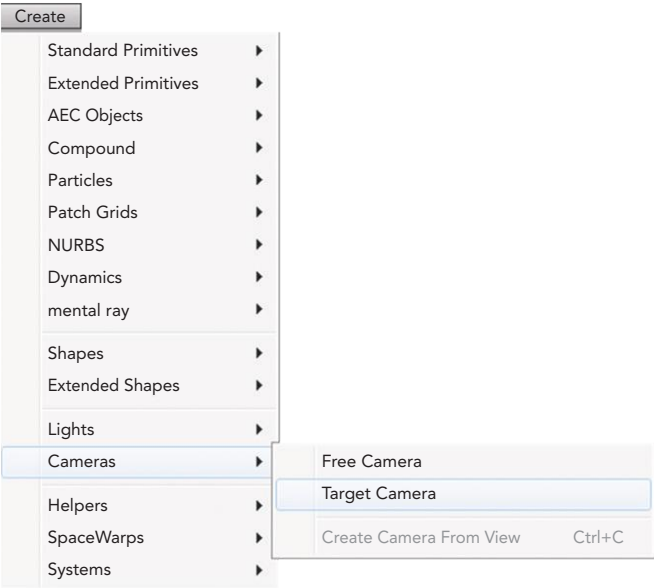
6 The rest of the 3D model is created using the same commands.



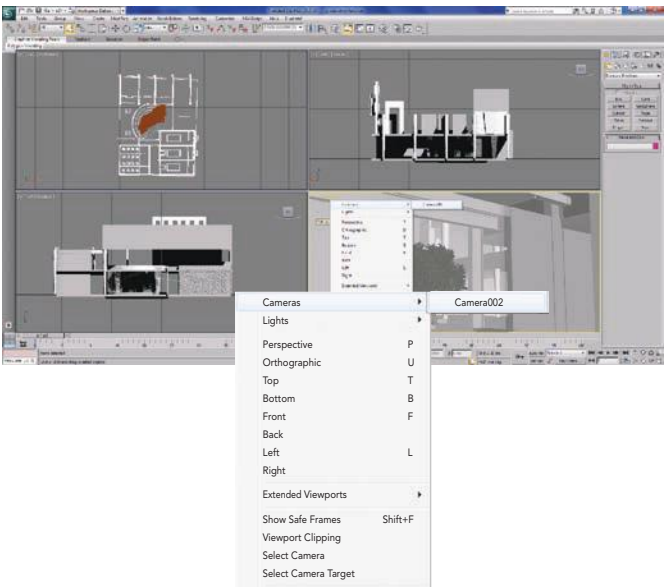
7 The model is then saved and imported into 3ds Max.



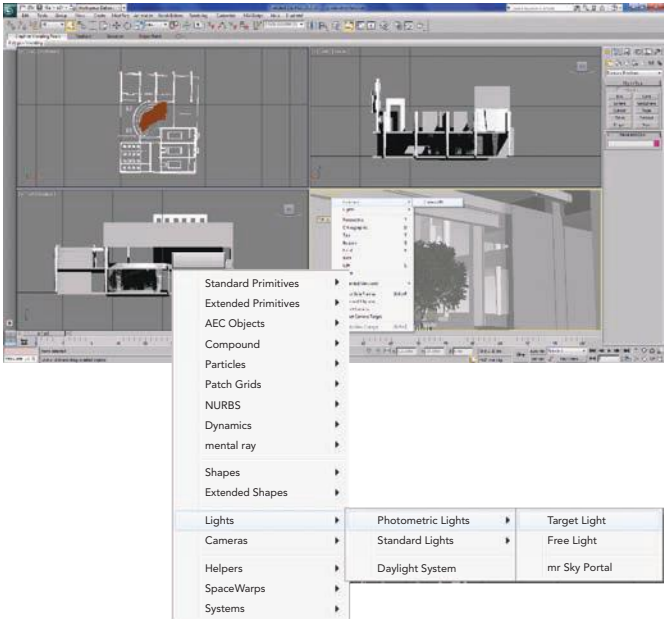




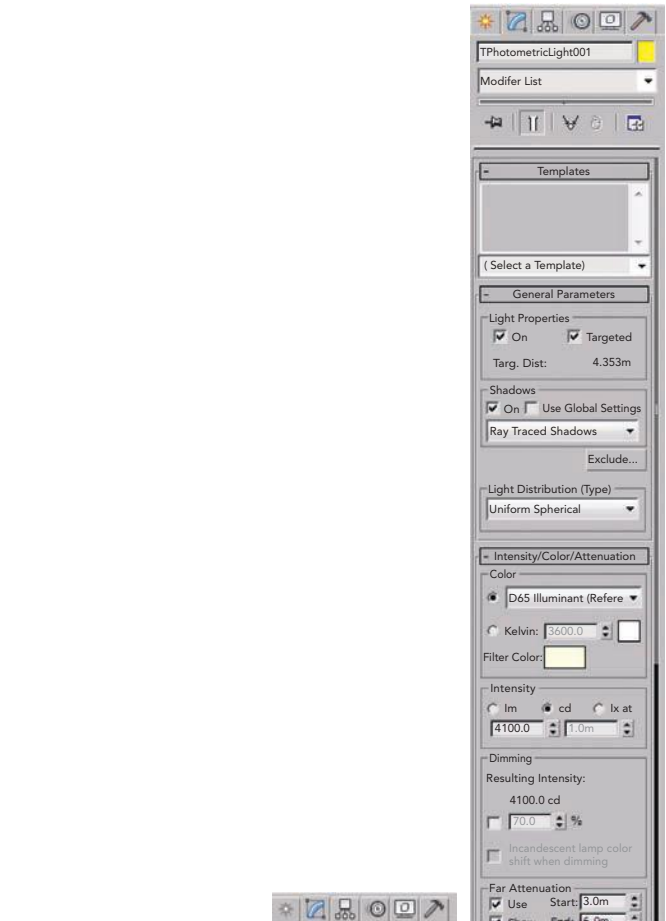
8 A Target Camera is created (Create>Cameras>Target Camera), and then clicked and dragged into the desired location.



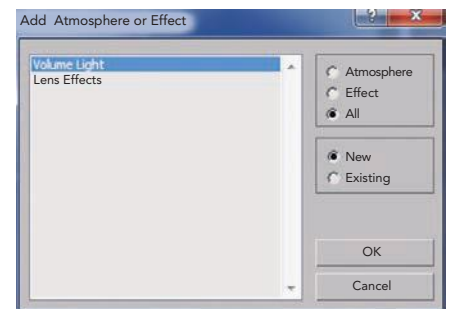
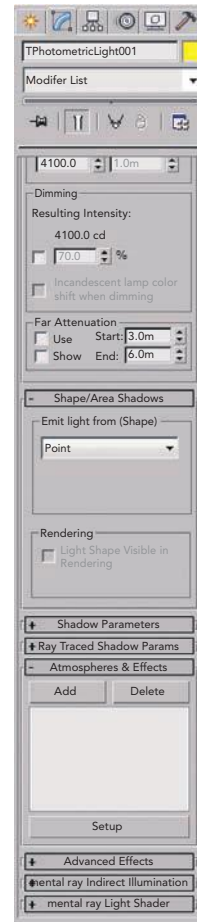
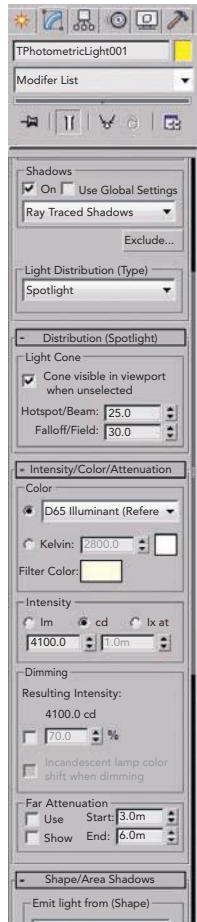
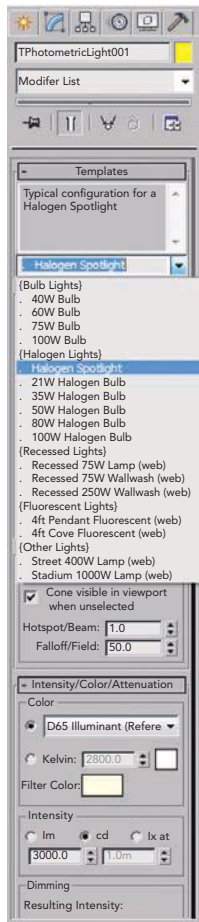
9 It is possible to change from one of the default views to the camera view by right-clicking on the viewport's name and selecting the appropriate camera.



10 A photometric light is made (Create>Lights>Photometric Lights).

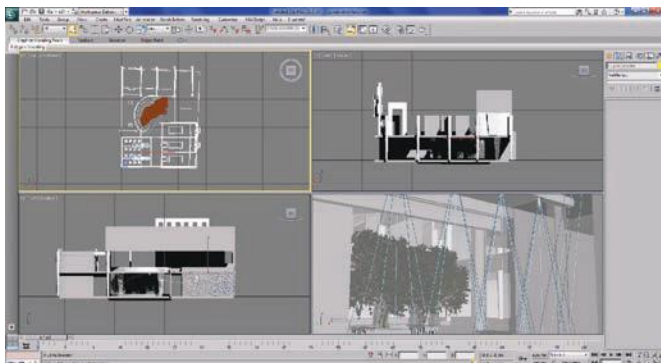


11 The light's properties can be changed in the Modifier List (click the Modifier button in the Command panel).

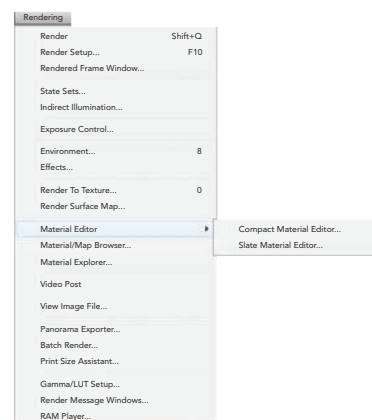


12 For this scene, a Halogen Spotlight template is used, with a 25-degree angle specified for the emitted beam and a value of 4,100 Candela specified for the Intensity value.

13 The light is made into a Volume Light by clicking Add under the Atmospheres & Effects tab and selecting Volume Light from the effect list.

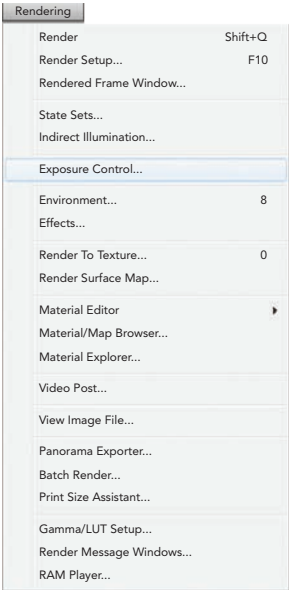
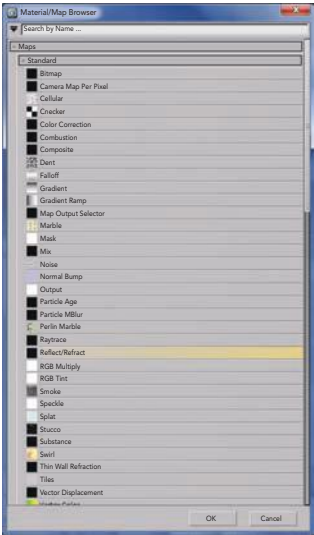
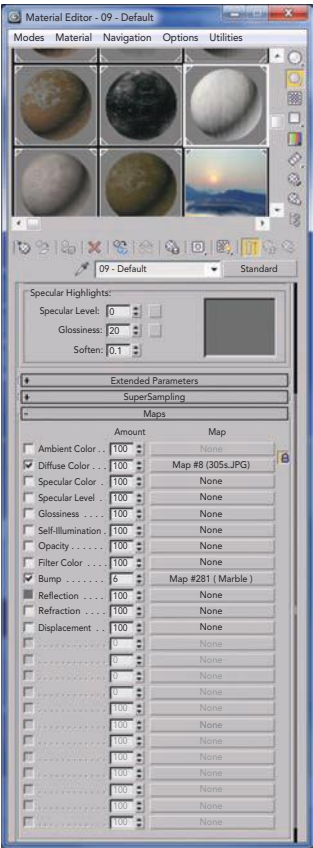


14 The rest of the lights are created in the same way.



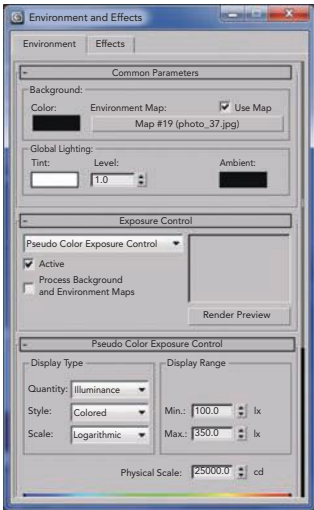
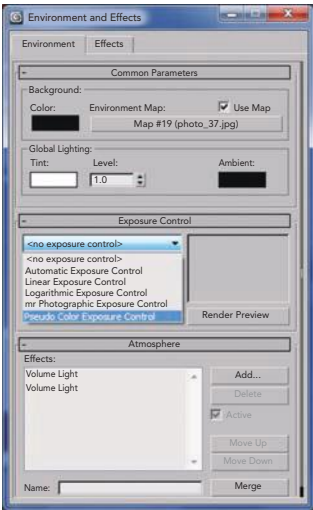
15 Materials are added to the scene and customized using the Material Editor, which can be accessed via the Rendering tab.



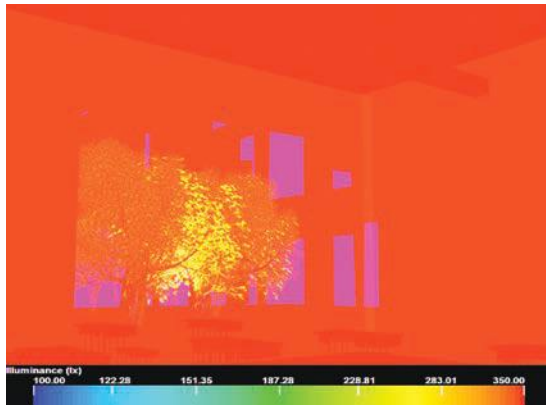


16 One of the material properties that can be edited is Reflection. Reflection can be added to a selected material by clicking on the map (default is set as 'None') and then selecting Reflect/Refract in the Material/Map browser.

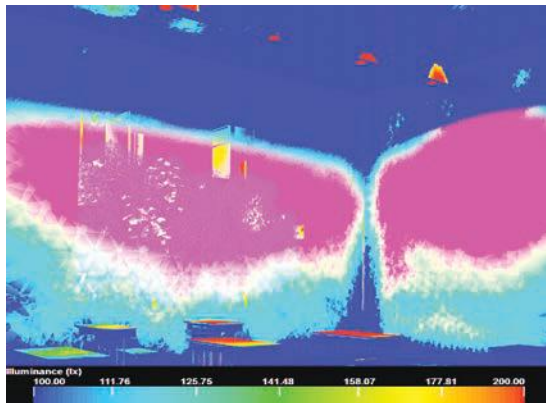
17 After materials have been assigned to all objects, it is possible to examine the lighting conditions of the chosen part of the building, which can be achieved by generating luminance and illuminance maps. This can be done in the Environment and Effects panel, accessible via the Rendering tab.



18 In the Environment tab, the Exposure Control is set to Pseudo Color Exposure Control. As the selected space will be used for handling artefacts sensitive to light, the minimum and maximum values are set to 100 lx and 350 lx accordingly.



19 The Illuminance map rendered is shown below, along with a photorealistic version of the scene.



20 As is obvious, the amount of light arriving at the working areas' surfaces exceeds what would be suitable for the function of this space. After further experimentation with the room's materiality, size of openings and the lights' properties, a more desirable result is reached, as shown in the new map and final rendered output.

## Mixed media

Mixed-media drawings use a combination of techniques, mixing hand-drawing and different software according to the design process or the intended nature of the final artefact. Accepting the limitations of standard forms of plotting, projected and screen-based media, mixed-media drawing offers enormous potential for further developments in architectural visualization.

A hybrid approach to drawing can be particularly useful in the early stages of design. Shifting between hand-drawn and digital techniques can allow a drawing to become a more flexible vehicle for creative thinking, facilitating diverse design approaches in a way that acknowledges drawing as a creative act of discovery, rather than the predictable application of procedures, or illustration; a drawing can reveal something that would otherwise remain undisclosed.

Collages are central to the interpretative drawings that drive design forward. At the same time they are vital tools for understanding context and inhabited space. Collage in its simplest form is made of paper, either cut or torn, and here we illustrate an example of an early study for an urban cinema space and animator's studio (opposite). This drawing began to unravel shifts in scale and a play between real and fictive space that was to be experienced in the urban interior. The torn photocopies were pasted onto brown paper overworked with black pastel and chalks, giving the drawing a more immediate

### Below

Saraben Studio's itinerant battery-powered coastal terrain, mixed media, L.A.W.u.N Project #21.





character of being worked when compared to a digitally generated image. This material quality of the drawing-as-artefact is traditionally the realm of collage.

The collages illustrated on page 75 are early studies for a project, set in London's East End, for a shared external space related to places where cloth was traded, worked and displayed. Taking the context as a whole, design strategies for this marketplace were initiated by making 'material collages' using cloth, thread, hemp, jute and dressmaking patterns. These kinds of drawings were 'registers' of a thought process, at a stage where the final proposal was unclear, as much as they were drawings that expressed the material and fragmented spatial conditions of the context.

Other collages, related to later stages of this project, are made entirely of torn tissue paper. These sketches are scanned and developed in Photoshop to show a more controlled structure and areas of light and to articulate spatial proposals. The space and colour of these 'paper walls' preceded the detail development of the project.

The architects Buschow Henley explore the process of photographic etching using black and white CAD images (see page 118). This kind of process is interesting in the sense that it allows for precise drawings to be reproduced that have an attractive surface quality, either through the paper itself or through the layering of printing inks.

#### **Below**

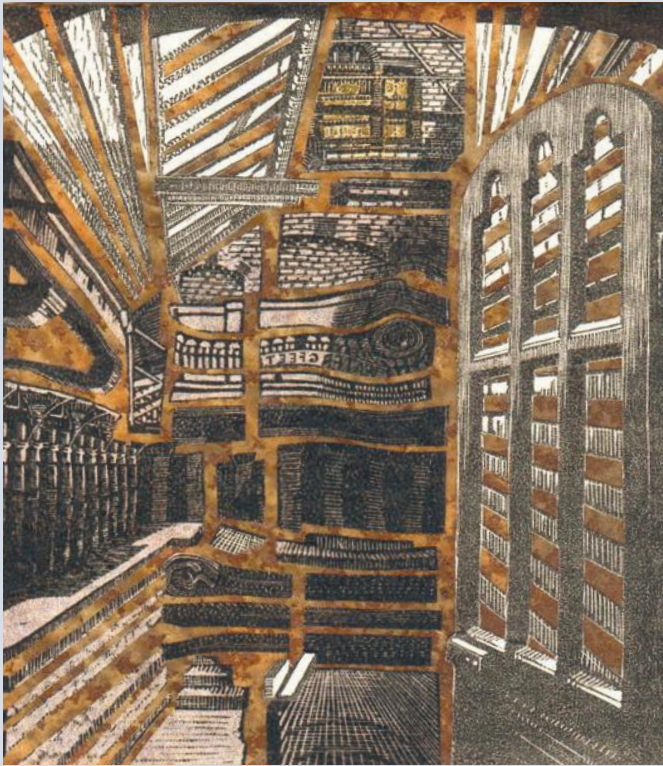
The simplest and most immediate form of mixed-media drawing is collage. Here is a collage done at the early stage of design development, using torn paper and charcoal. Wrapping paper creates a useful mid-tone brown background.



#### **TIP** DIGITAL IMAGE SIZE

When working on hand- and digital-drawing techniques, save time by making sure the image size is no bigger than that necessary for the output device settings.

## Case Studies: Mixed media



1

1. The work of the artist Anne Desmet shows how printing can be used with the expressive freedom of collage. *Interior Shards*, for example, is a wood-engraved print and gold leaf collaged onto ceramic tile. It is made from small cut sections of other engravings combined to create a sense of entering one of the pool areas of the derelict Victoria Baths in Manchester. The paper pieces are collaged onto a rust-red ceramic tile to generate a sense of the colour of the brickwork of the interior (sandstone); the fact that the interior is also extensively tiled; and, at the same time, to suggest a sense of the exterior brickwork which has distinctive, decorative, red and white stripes. The fragmentary nature of the collage is also intended to convey a sense of the disrepair of the building that it depicts.



2

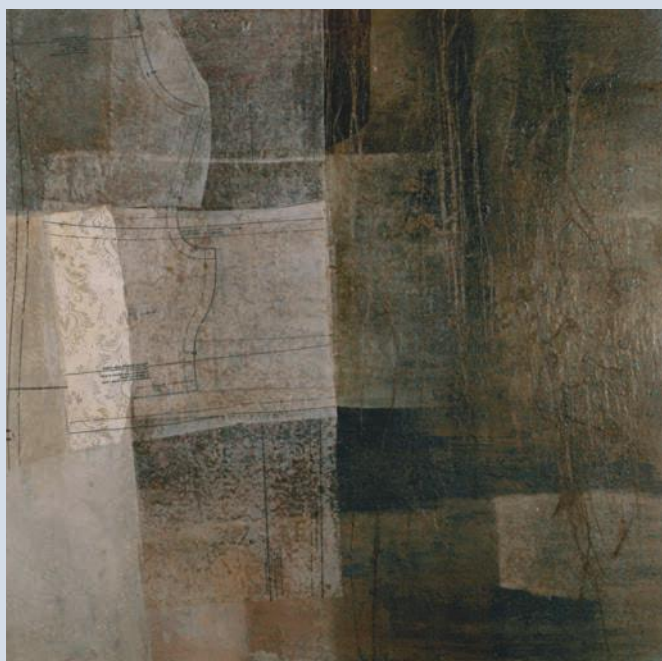
2. In contrast to craft-based technique, textures and model photographs can be used effectively to create convincing fictive space in digital mixed-media drawings. This image by the architect Janek Ozmin works with model photographs and material textures to develop extraordinary digital collages that represent spaces that are part found in the scale model, part imagined and part revealed through the process of making the image itself. This kind of sequence of a mixed-media technique is exemplary in the way that it drives the design process forward.





3a

3a, b. These mixed-media drawings, *Interior/Exterior I* and *II*, formed part of a preliminary study for an architectural project in London. The drawings were made on a wood base that was clad in canvas and layered with gesso. They were initially formed using tissue-paper dressmaking patterns that related to what was to be the eventual programme for the project. They were fixed onto the base with rabbit-skin glue. Mid-tones and shadows were formed using diluted bitumen and other materials that related to site studies. Cotton, fabric, tissue paper and jute gave the drawings a material quality that inspired later stages of the design.



3b



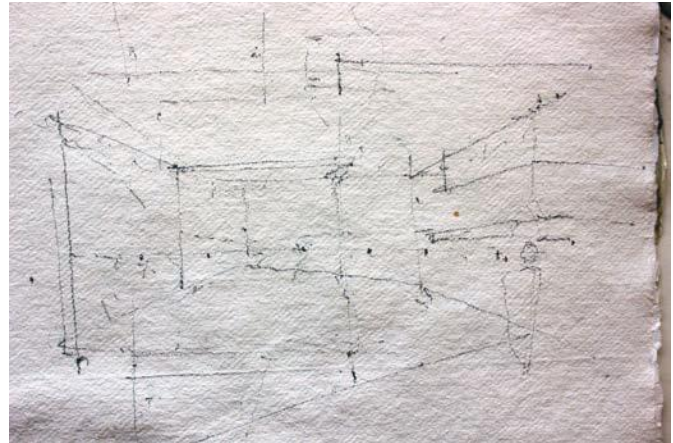
## STEP BY STEP COLLAGE

Handmade collage provides a spontaneous way of thinking about a setting, especially at the start of the design process. It allows you to play with sketch ideas for light and dark, texture and scale; importantly, the process has a material quality. The quality of paper and other fabrics that might be

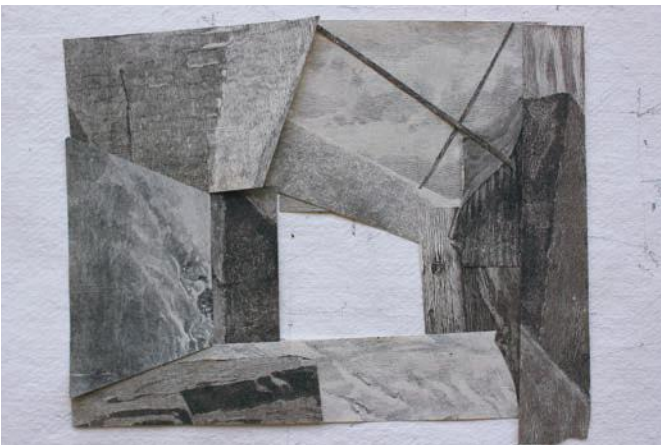
used in collage engages the imagination in a different way to screen-based drawings. Thinking about places using collage engages our material imaginations. In the following sequence, a rapid sketch is produced for a garden room that looks out over a valley.



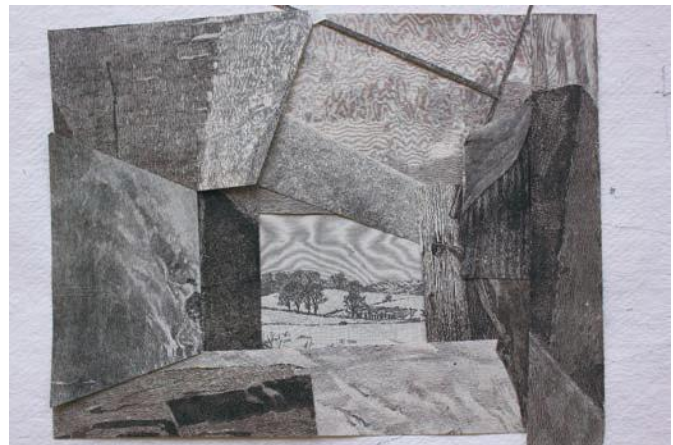
**1** Paper collage can be made using a cutting tool's straight edge. Otherwise, paper can be torn. A selection of old papers can be used to develop light structure for a space.



**2** Collage might start with just laying down paper. More often, the idea for the space is sketched out. This will change as the collage develops and new ideas open up from the process itself.



**3** Guided by the sketch, the first pieces of tone are laid down to create the sense of an interior, window and rooflight.



**4** Exterior landscape is added to give a reference to the context of the room.



- 5 With these initial ideas starting to emerge, the landscape is painted with white pigment in rabbit-skin glue (pre-prepared gesso would also work if applied thinly). This tones down the landscape image, giving the sense of distance beyond the frame of the opening.



- 6 Detail of the space is developed – glues may vary from spray mount to other paper glues, such as PVA (of which there are many types). The best is rabbit-skin glue or similar.



- 7 Detail of opening towards landscape added. These lines may be drawn, but here are made from thinly cut, dark tones from newspapers. These can be easily adjusted and rearranged before gluing.



- 8 The roofline is adjusted and shadows are partially added.



## STEP BY STEP MONOPRINTING

The following four sequences by the artist Helen Murgatroyd demonstrate printmaking processes using various techniques and media.



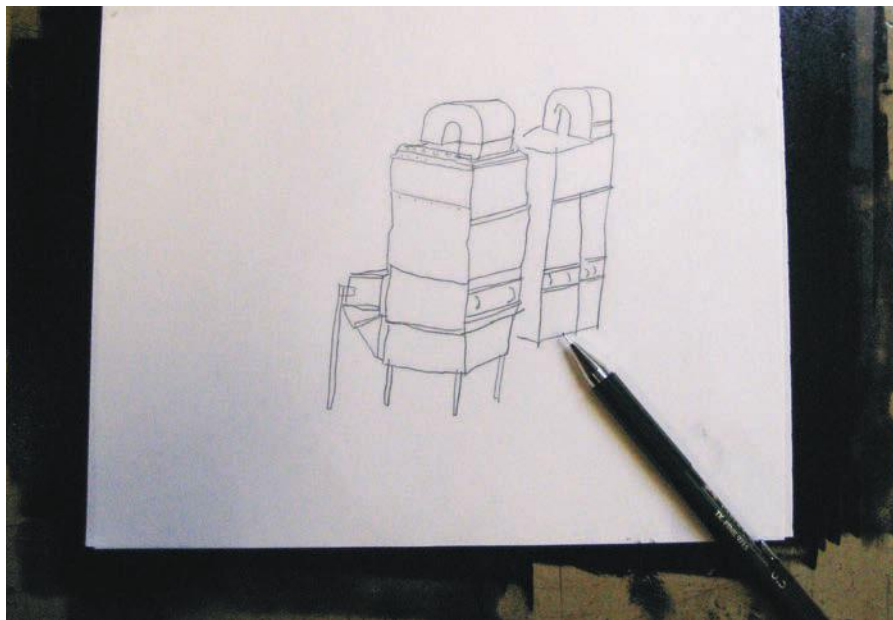
- 1 Place a small amount of ink onto a flat surface. A piece of glass or Perspex is ideal.

Using a roller, roll the ink out evenly across the surface. Keep rolling until the ink makes a sticky, tacky sound.

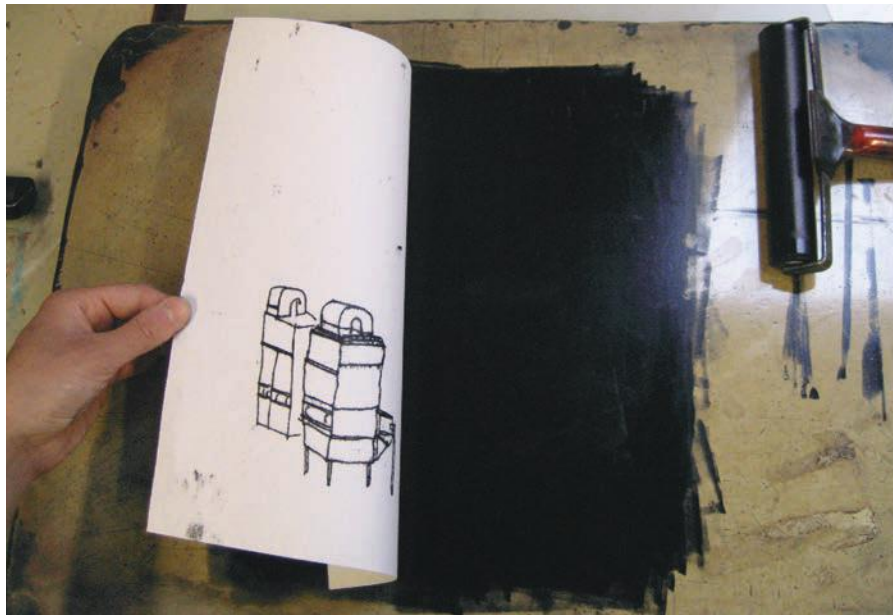


- 2 Very gently place a plain sheet of paper on top of the rolled-out ink.

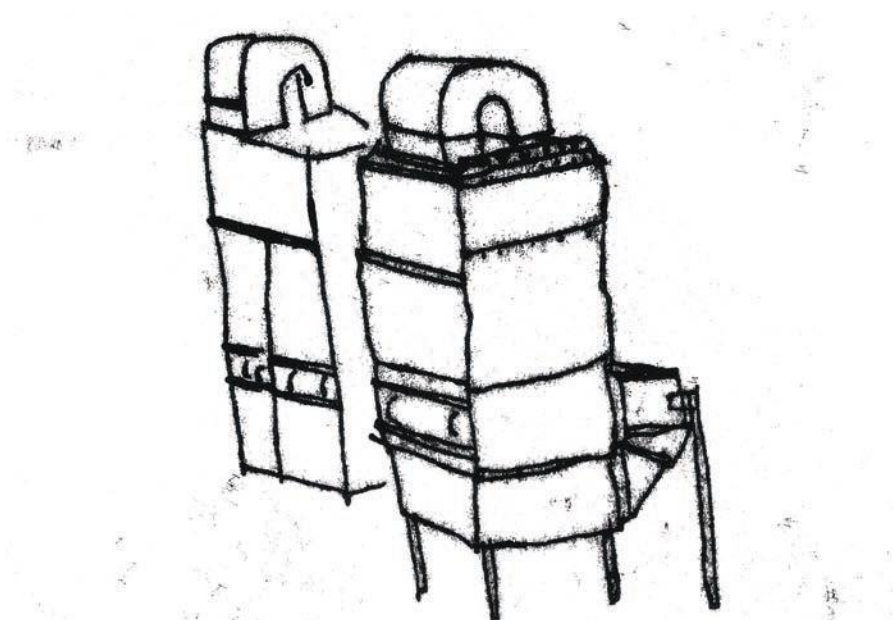




- 3 Using any tool (a pencil was used in the example shown) draw the image onto the paper. Take care not to place any pressure on areas of the paper where no ink is to appear.



- 4 Lift the paper from the ink, and your image will be printed in reverse on the other side.

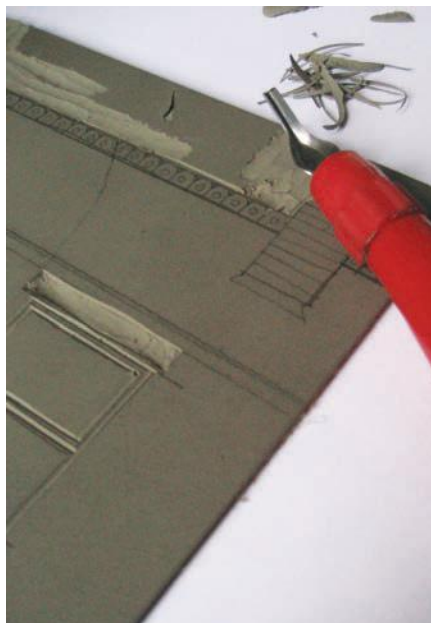


- 5 Explore different tools for mark-making, such as combs for a series of lines or needles for very fine marks, and try using fingers for covering large areas. Varying the amount of pressure will produce a range of different tones.

# STEP BY STEP LINO CUT



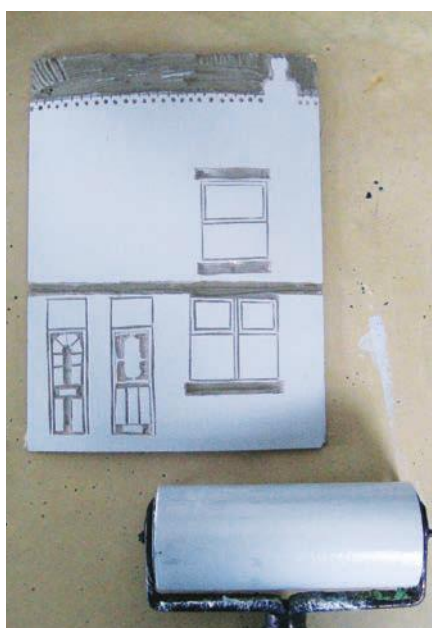
**1** Prepare the selected image, working out the areas for each colour. Transfer the drawing onto a piece of lino.



**2** Prepare the lino for printing the first colour. Using a lino tool cut into the areas that are to remain 'white' (or the colour of the paper you will print onto).



**3** Mix the first colour and roll the ink out onto a flat surface. Only a very tiny amount of ink is required. When you hear a sticky, tacky sound when rolling, the ink is ready to roll.



**4** Roll the ink very thinly and evenly onto the lino.



**5** Place the lino face down onto your paper and roll over the back of it with a clean roller, applying plenty of pressure to make a good, even print. A printing press will give better results.







**6** Once the lino is clean, cut into it again for the second colour. This time, remove all the areas that you would like to remain printed in the first colour.



**7** Repeat the inking process, with the ink rolled thinly and evenly over the lino as with the first colour.



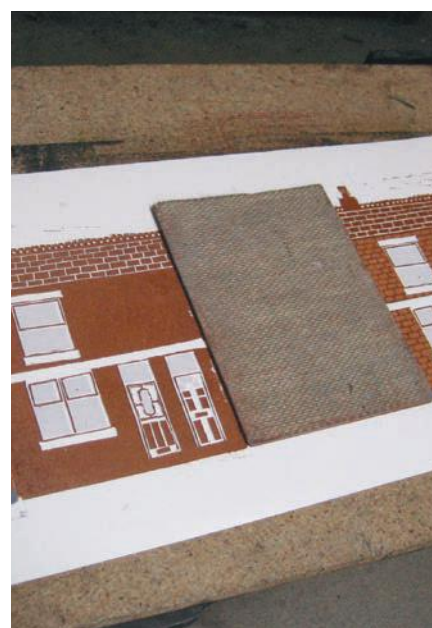
**8** It is important to get the registration of the second print right so the colours line up correctly. If using a press, marking a piece of paper with the position of the lino and the paper is a good way to do it. If using a roller, use the corners of the lino to line it up.



**9** Cut into the lino again in preparation for printing the third colour. Follow the same inking process.



**10** When cutting out the areas for the final print there will be hardly any lino left on the tile; only the area for the final, and darkest colour. The tile will be a bit floppy because of this.

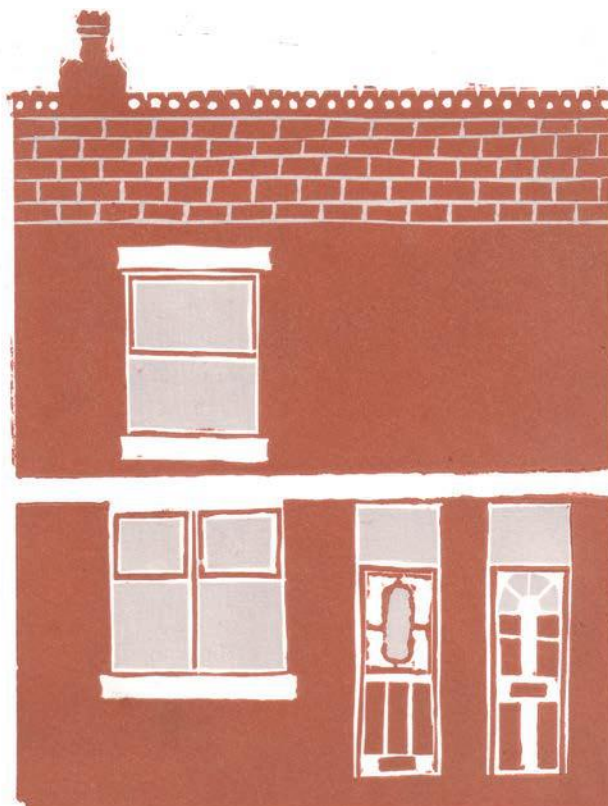


**11** Repeat the printing process for the final time; the final print is ready.





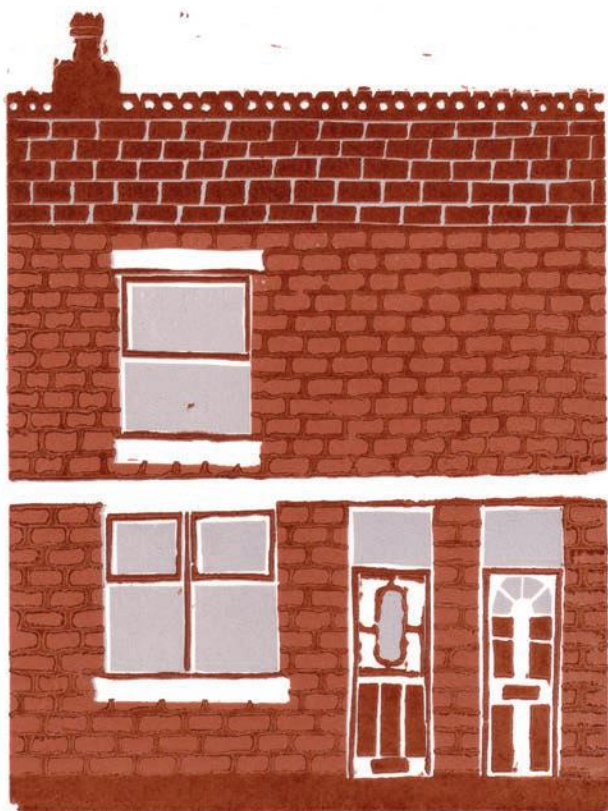
Stage One



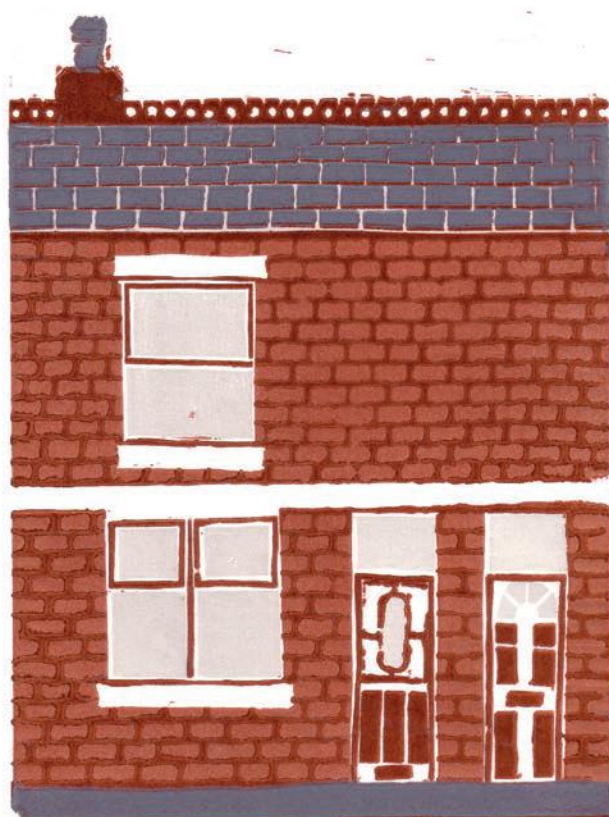
Stage Two







Stage Three



Stage Four

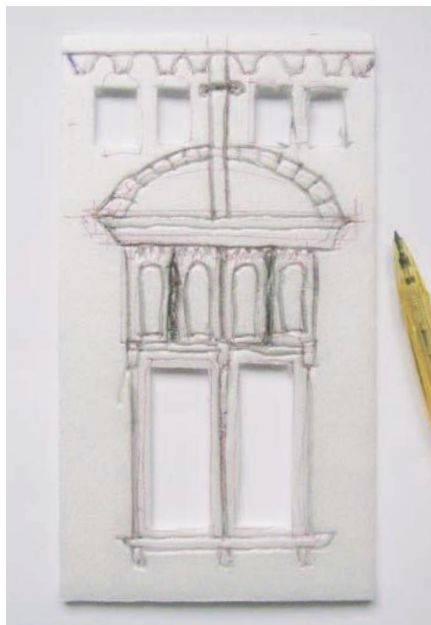




## STEP BY STEP PRESS PRINT



**1** Draw the image onto the press print polystyrene tile, making sure not to apply too much pressure.



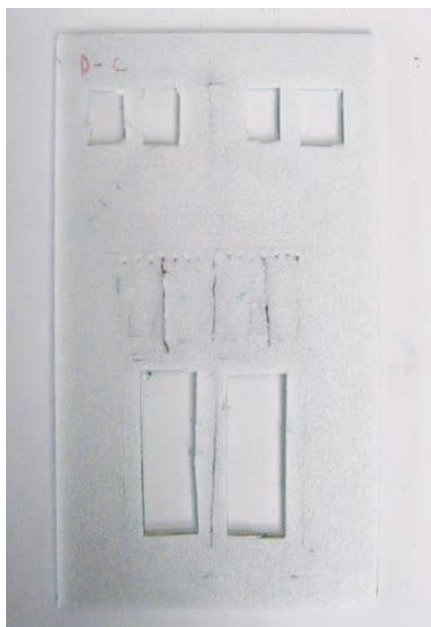
**2** Using a ballpoint pen, draw back over the design, making an impression into the polystyrene. Experiment with different tools to make different marks on the tile. A sharp knife can also be used to cut away bits of the tile.



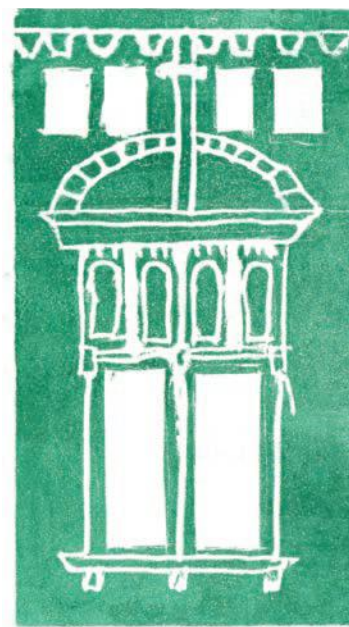
**3** Roll the ink out onto a flat surface until you hear a sticky, tacky sound.



**4** When the ink is making the tacky sound, it's ready to roll onto the tile. Roll it thinly and evenly, making sure you cover the whole tile.

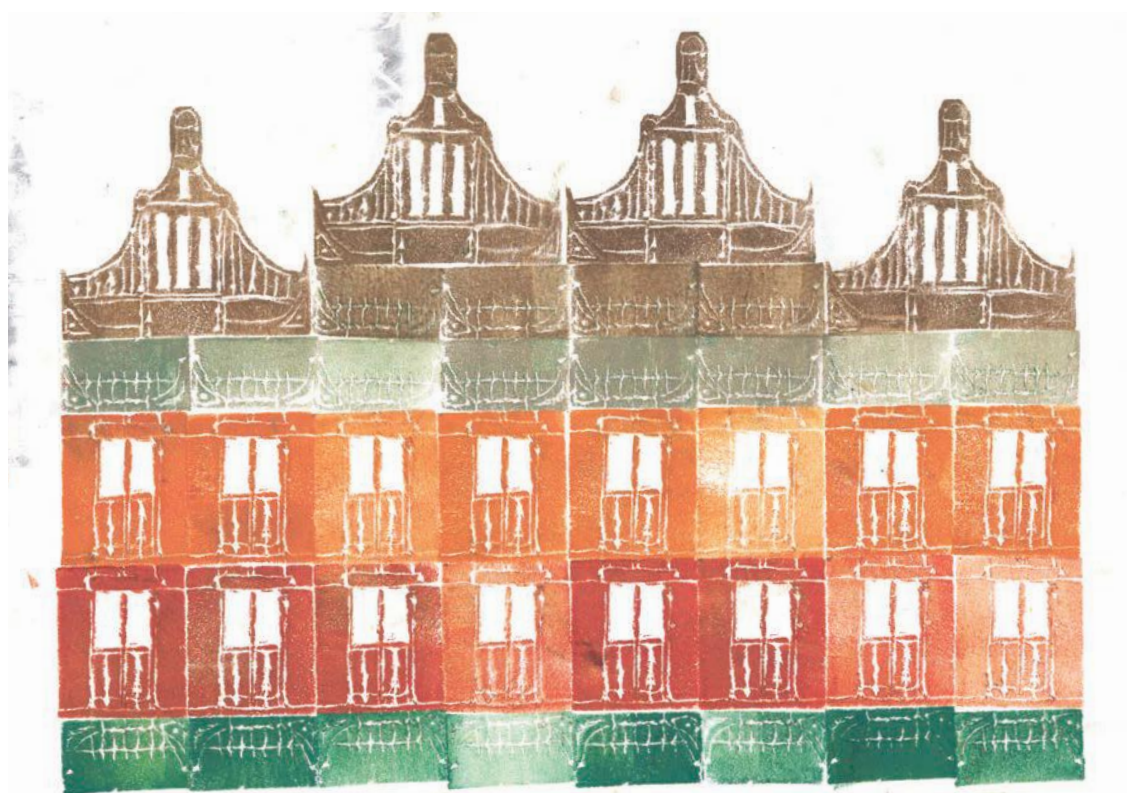
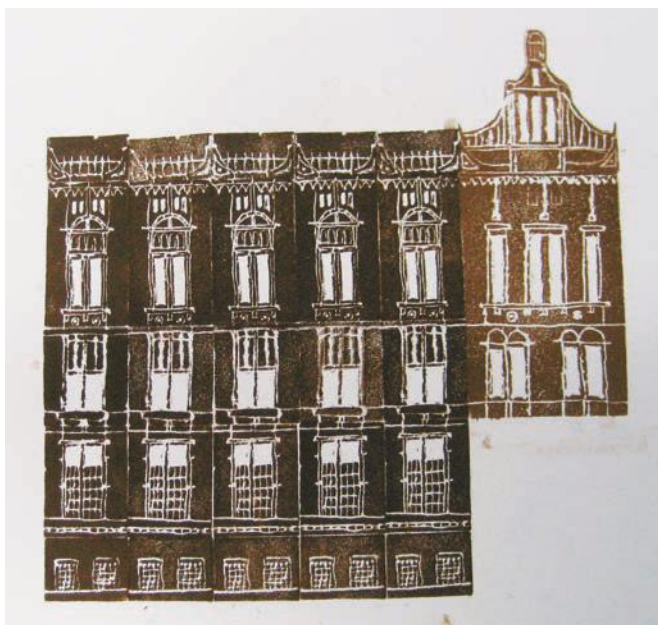


**5** Place the tile face-down onto your paper and roll over it with a clean roller.



**6** Even the subtle marks made on the polystyrene will be picked up by the print.

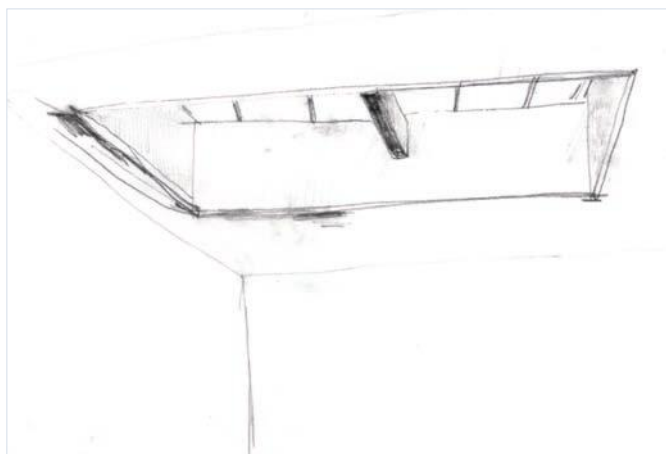




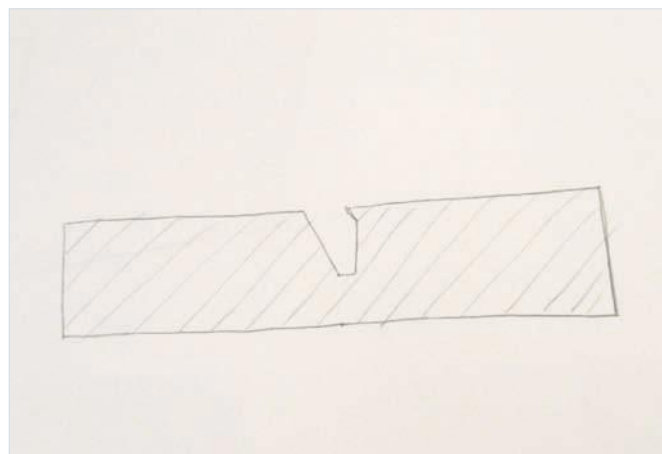
7 Experiment with repeated patterns and different coloured inks. The great thing about press printing is that it is very quick and immediate

as the tile takes little time to prepare, but the polystyrene won't last long if it is being repeatedly inked and cleaned.

## STEP BY STEP SCREEN-PRINTING WITH PAPER STENCILS



**1** Do a plan for the screen-print, working out which areas will be printed in which colour, and how many colours will be needed for the print.



**2** Mark out each stencil on a sheet of thin layout paper or newsprint. It is important to use thin paper so the ink will hold the paper onto the screen when printing.



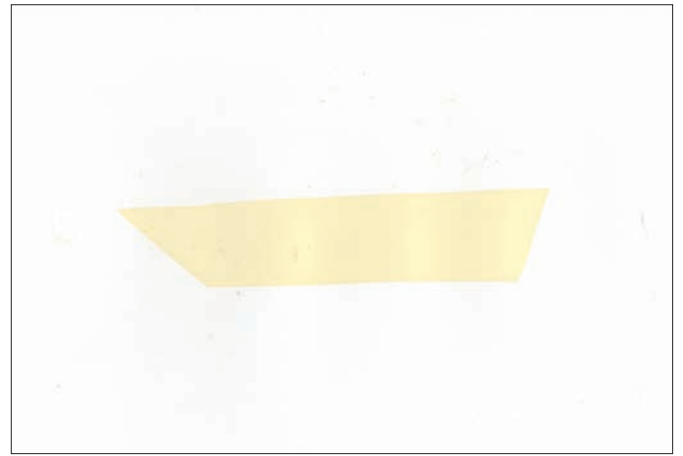
**3** Cut out each stencil accurately using a sharp scalpel or scissors.



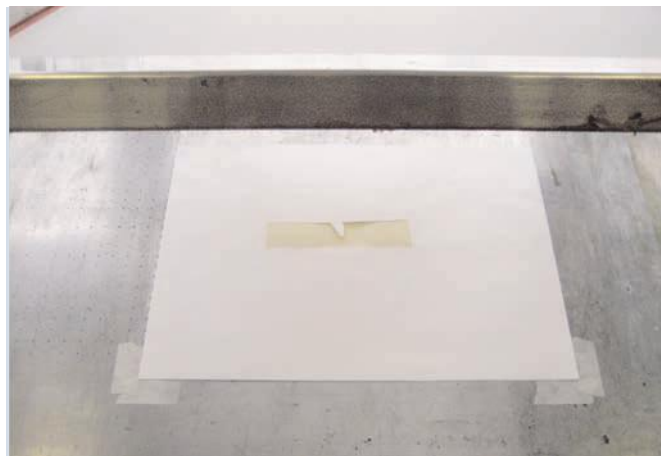
**4** Mix the printing ink. For water-based screen-printing, acrylic paint can be used, which is much easier to clean than oil-based inks. The acrylic is mixed in equal parts with a printing medium to prevent it from drying too fast and blocking the mesh on the screen.



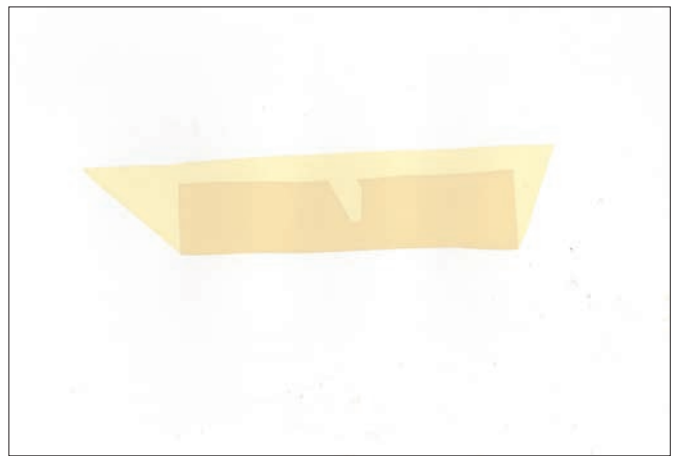
**5** Lay the paper for printing onto the screen-printing bed, with the stencil over the top and then the mesh screen on top of that. Ink is dragged through the screen using a squeegee. Print the lightest colour first, working up to the darkest colour; light colours won't print well on top of the dark colours.



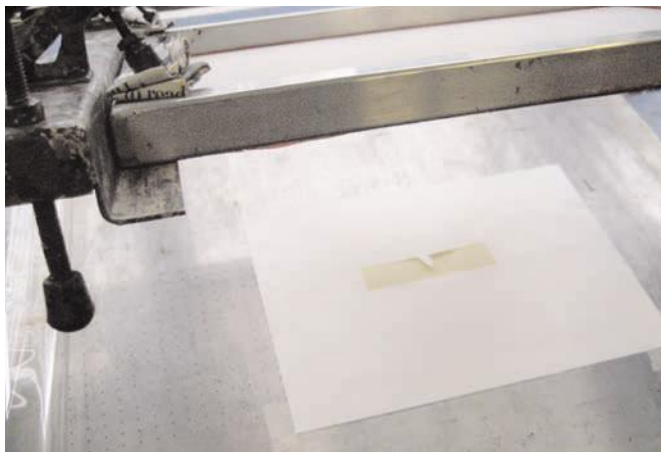
**6** Stage One



**7** Once the first colour is dry, place the print back onto the printing bed, and line up the second stencil, with the mesh screen on top of that. Masking tape can be used in the corners, which is especially useful when printing more than one copy.



**8** Stage Two



**9** Repeat the printing process until each of the colours is printed.

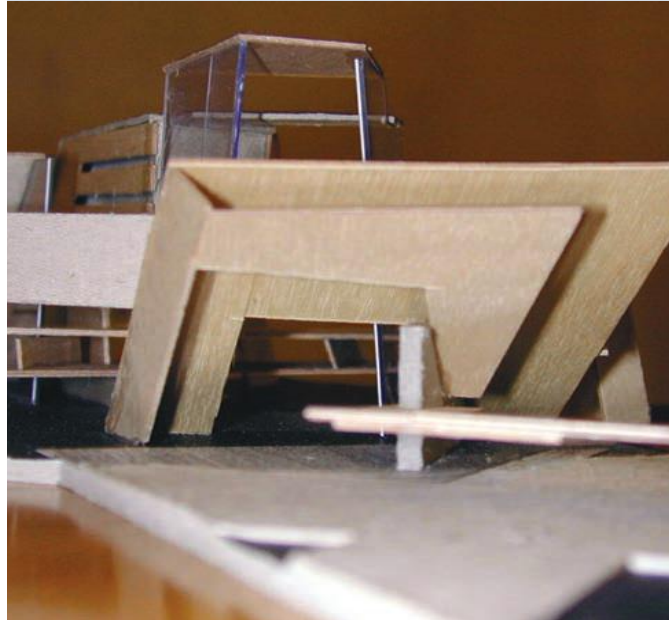


**10** The final artwork

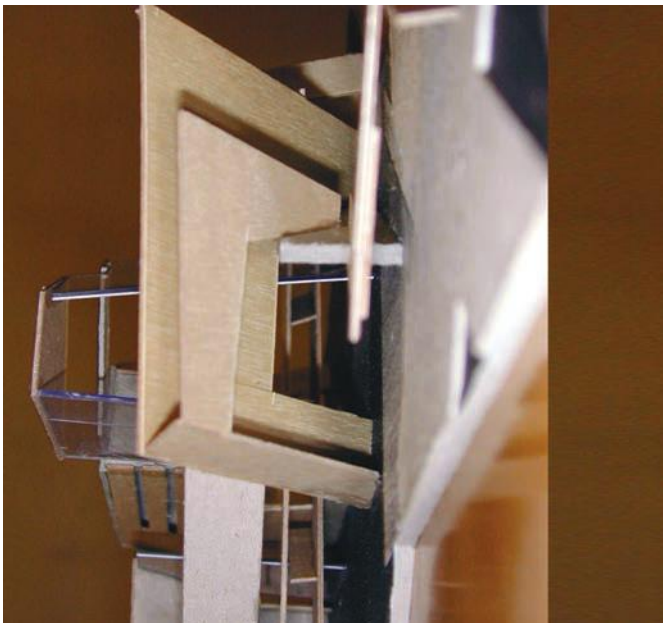


## STEP BY STEP MODEL/COMPUTER COLLAGE

In the following sequence architect Janek Ozmin skilfully brings together model images and related textures that are combined in Photoshop. The collage is a spatially rich study that records a process of thinking and establishes a broad spatial topography, inspiring further, more detailed studies of the eventual urban and building proposal.



**1** Base material: The study started with the generation of a 1:1,000 sketch model for a conference centre made from grey card, beech laminate, black paper generated from a photocopier, photocopied laminate and 1mm clear plastic. Ozmin took a series of digital photographs as part of the exercise with the intention to digitally collage people into the model as part of a spatial study.



**2** After completing the first study the original image was moved around using the Rotate Canvas command. After re-orienting, the canvas was stretched using the Crop tool in reverse to just off square and the blank space was filled with a stretched section of the brown background.



**3** Composite space: the brown section was later masked out in white, which gave the stone floor a reflective quality. Finally a second photograph, taken from a slightly higher position than the composition, was added and positioned at 180 degrees to the original image.



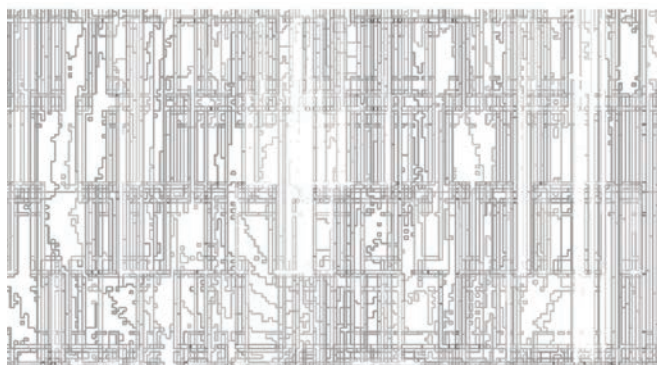
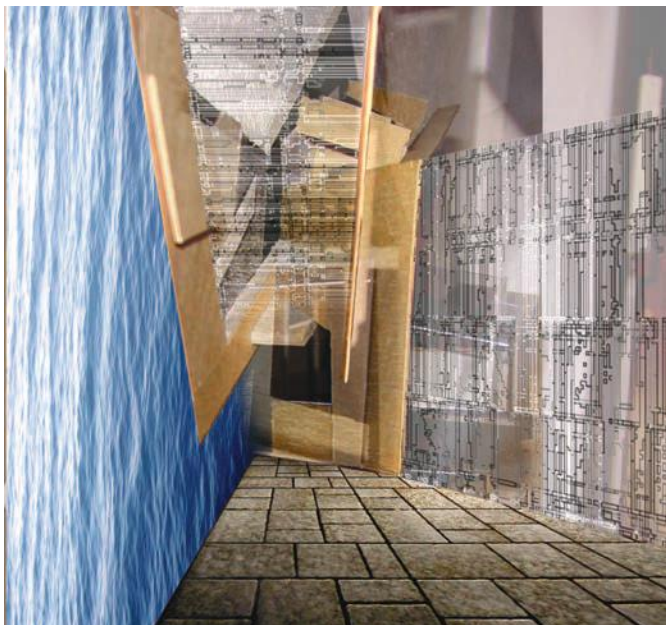
- 4 Keeping the background photograph as a constant, the second photograph was made transparent (above); this immediately increased the spatial experience, creating several areas for the eye to engage with. Focusing on the central portal, the second photograph was copied again and elements of the image were deleted with the Airbrush eraser tool (see right).

Leaving the copied layer transparent increases the visual impact of a portion of the second photograph, giving the overall image a foreground without losing the complexity of the transparencies.



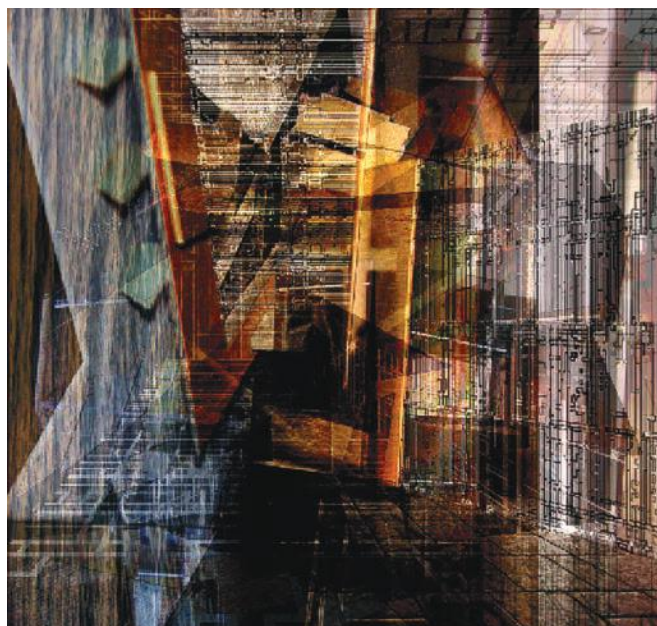
- 5 Working with the layered composition a space was created using a one-point perspective technique, focusing on the dark section at the centre of the image. Lines existing in the model were extended and three masking planes, two walls and a ground plane were created (above). The masking planes were then made transparent to reveal the space behind (right).





**6** Materials: Three materials were selected to be added to the composition. The water and the stone floor were both found using an image search on the Internet. The wall and overhead screen were generated by extracting vector lines from a digital image (below right). Using the Layer Mask tool in Photoshop, the images were applied to the composition and stretched into

perspective using the Free Transform tool. Note that the water has been made lighter and colour-saturated compared to the original image (top).



**7** Textured space: Reducing the transparency of the masks reveals the background textures. The transparency of the masks will require you to revisit the original materials as with the water, which has now faded and is no longer at a different saturation to the rest of the image.

**8** Luminosity: Finally the whole image was selected and copied using the Copy Merged tool and pasted back into the drawing. The composition was adjusted using the Brightness and Contrast tools and the centre of the drawing was saturated using the Burn tool set to Shadows. This removes the milky feel of the previous frame. This image forms the first stage of the process before finishing and printing.



## STEP BY STEP TAKING A COLLAGE FROM TWO TO THREE DIMENSIONS

In the following sequence, architect Maria Vasdeki brings together models, photographs and Photoshop collage to develop a project in terms of the way in which light and textures articulate sequences through a building.

A range of techniques is used, starting with photography of models lit *in situ*. Here, the emphasis is on finding a balance

between light and dark. These photographs form the basis of initial ideas of how the building might be structured spatially, and how a resultant massing be situated (oriented) in location. CAD models, along with more detailed studies of specific sequences, combine formal opportunities with material conditions of space.



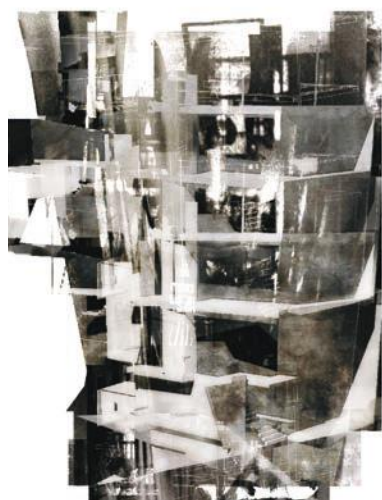
- 1 Photograph of initial study model, looking at light and dark and ideas relating to materials and orientation.



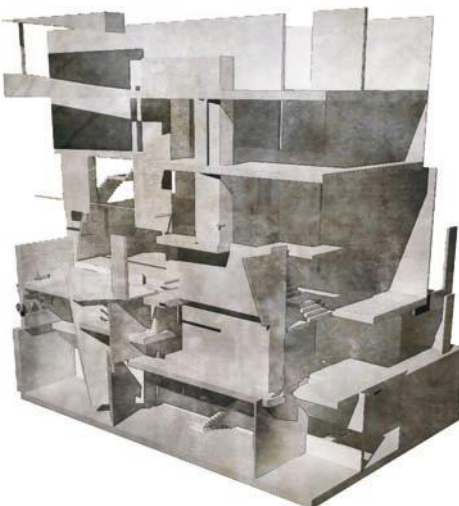
- 2 Initial studies to explore orientation, massing and context. This combines sketch CAD models and site studies.



- 3 More developed spatial understanding, articulated in section and model, is set against earlier background material and light studies. Key spatial sequences (circulation) are identified as experiences, keying internal configuration to external context.



- 4 Here the process is refined further, so that the model is articulated according to questions of sequence and scales of experience, where light (orientation) and the material conditions of space are integral to formal development.



- 5 In the final clay rendering, the architectural proposal is more defined and sets the basis for more detailed stages and the eventual technical resolution. During the next stages of the process, orthographic drawings, sketches and models all contribute to the three-dimensional integrity of the earlier stages of the project.

plan 1:150

1330 sun axis

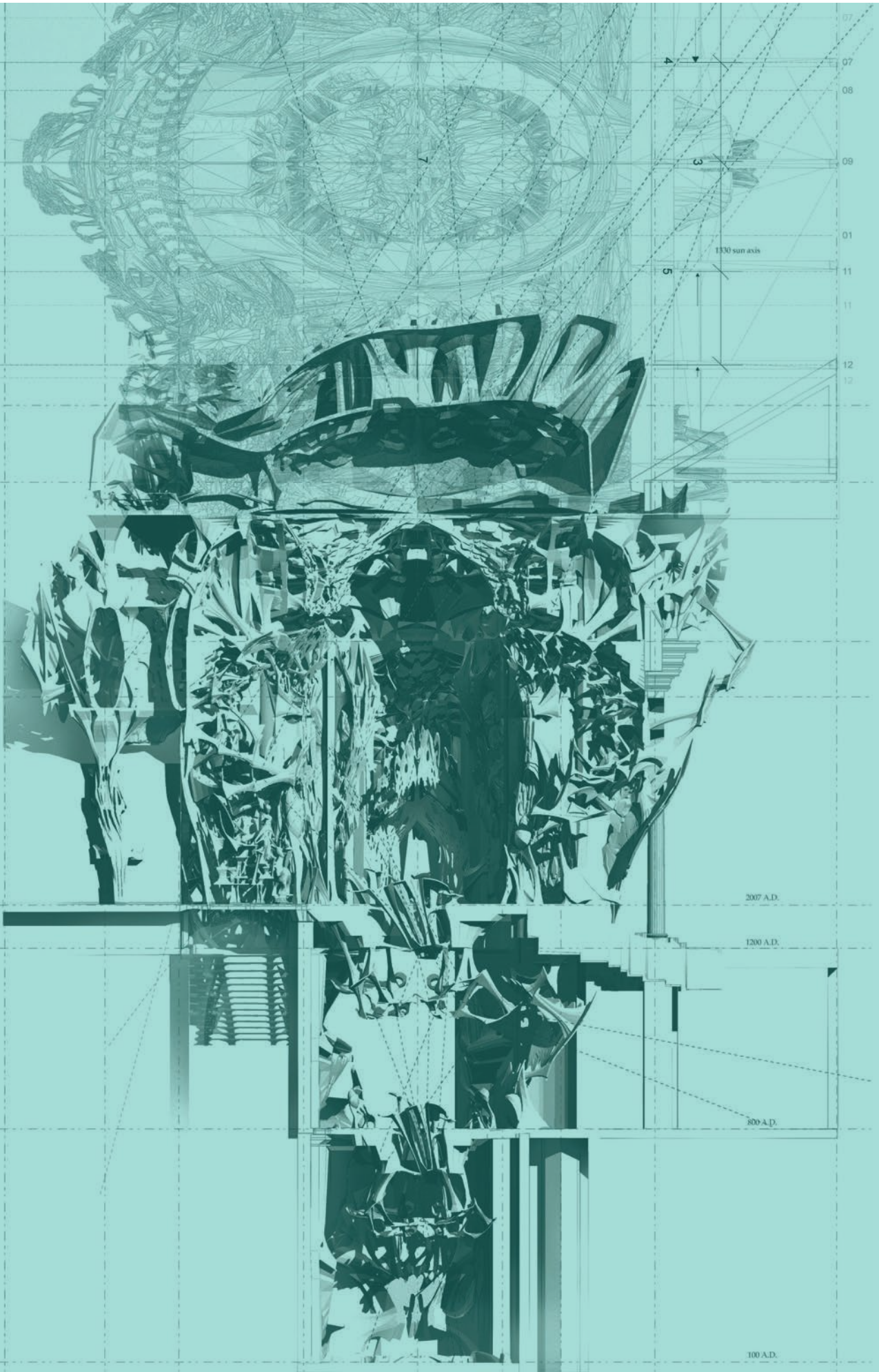
section 1:150

2007 A.D.

1200 A.D.

800 A.D.

100 A.D.



# TYPES

**94** INTRODUCTION

**96** SKETCHES

**102** DIAGRAMS

**106** PLANS

**116** SECTIONS AND ELEVATIONS

**122** AXONOMETRIC AND ISOMETRIC PROJECTIONS

**132** PERSPECTIVES



**Previous page**

*Voided Veilism* by Kenny Tsui.

**Below**

This rapid pencil sketch shows how lines of different weights can capture a swift impression of a well-known Venetian scene.

## Introduction

Architectural drawing combines individual expression and convention in the communication of ideas and information. The first chapter, *Media*, described how drawing techniques could be explored in order to resonate with design approaches, or reflect, in the way they were drawn, the kind of project or idea that was being described. It emphasized the use of mixed media, and integrating hand and digital techniques, as a means of expressing diversity in the design process. This chapter will explore drawing types, arguing that, in the same way that a project may lend itself to a particular drawing technique, architectural ideas may be best expressed by emphasizing a particular drawing type.

This chapter covers architectural drawing types – orthogonal drawings (plans, sections and elevations); parallel projections (axonometric and isometric, dimetric and trimetric projections); and perspectives (one-, two- and three-point). It also provides an overview of simple digital modelling techniques.

These standard drawing types are preceded by a section on architectural sketches. More than any other drawing type, the sketch remains the touchstone of all our ideas; it is a key tool for observation, reflection and design development.



The sections on Plans and Sections and Elevations explore the central role that these two-dimensional orthographic projections retain in contemporary design production. These drawings remain fundamental to the process of making architecture: the ability to bring these two-dimensional drawings together in the imagination, understanding their interrelationships and correspondences, remains a creative discipline, vital for the architect.

These conventional drawing types may now appear static, even unimaginative, compared with dynamic, rendered digital models that can visualize complex architectural forms; plan and sectional drawings can be 'sliced' from such models. At the same time, however, these orthogonal drawings can embody a rigour and their strength as tools for thinking through design is that they promote consideration about the content of the programme, rather than its eventual shape, which is privileged by object-based software.

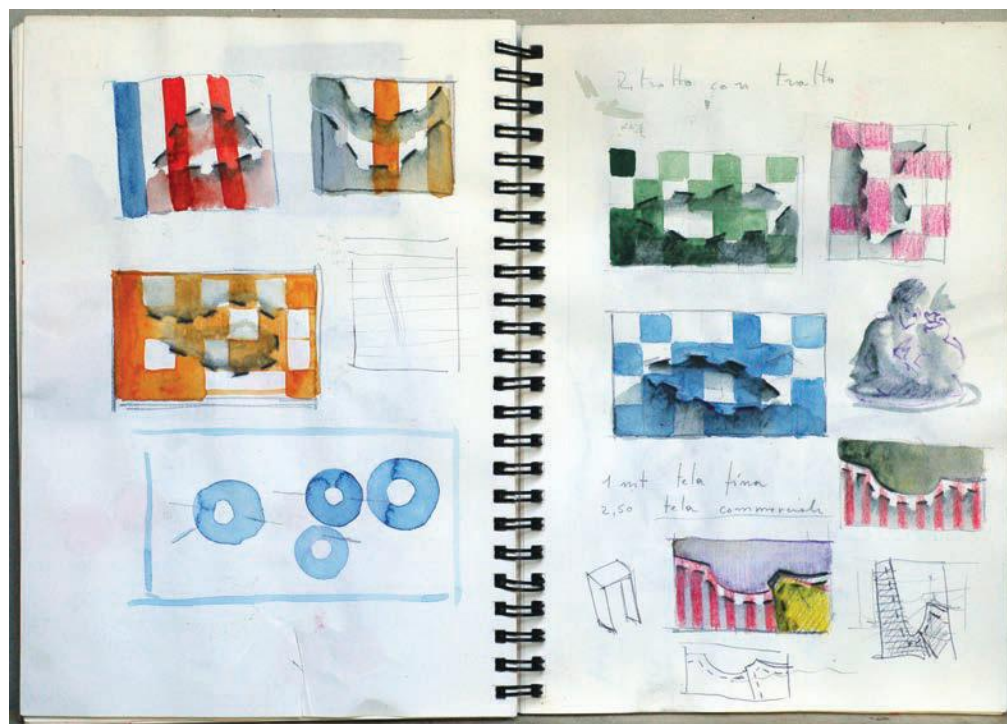
Unlike a finished, rendered model, plans and sections are drawings that depend on other drawings in order to be fully understood, rather than necessarily aesthetic objects in their own right. They may be grouped together with sketches or other three-dimensional artefacts as 'transitional drawings', or artefacts made during a design process.

These transitional drawings are different in character to illustrations; they facilitate a continuity of the creative process, a cycle that is about thinking, drawing and reflecting. By contrast, an illustration is an end in itself.

A designer still needs to be able to translate two-dimensional drawings into three dimensions. At the same time, however, this is now bypassed to a certain extent by modelling software that can simultaneously build three-dimensional form from other drawing types. Three-dimensional object information is input for each element, allowing the digital model to be created at the same time as plans and sections, which can be subsequently 'sliced through' from the model.

This process opens up new formal possibilities and ostensibly shifts the paradigms of the design process, from the discipline of orthographic projection, and the translation of those abstract drawings in the imagination of the architect, towards more immediate visualization of three-dimensional form. Digital modelling facilitates the formal imagination, where the shape and surface of the building, structure and overall massing can be visualized with relative ease. It is dimensionally consistent, and also allows the immediate visual impression of textures, light and shadows.

While computer-generated drawings have promoted a sense of freedom from the conventions of thinking through more traditional drawing types, they also have their own limitations, and the approach here is not to promote one drawing type over another, but to encourage an interchange between traditional and new drawing types – traditional and new ways of developing drawings – in order to open a more creative dialogue between digital and manual drawing.



#### Left

Mario Ricci's sketchbook uses pencil and watercolour to develop an idea that is later the subject of larger paintings and sculpture.

#### TIP SKETCHBOOKS

A student of architecture should always keep a sketchbook. For students and architects alike, it is a valuable record of process.



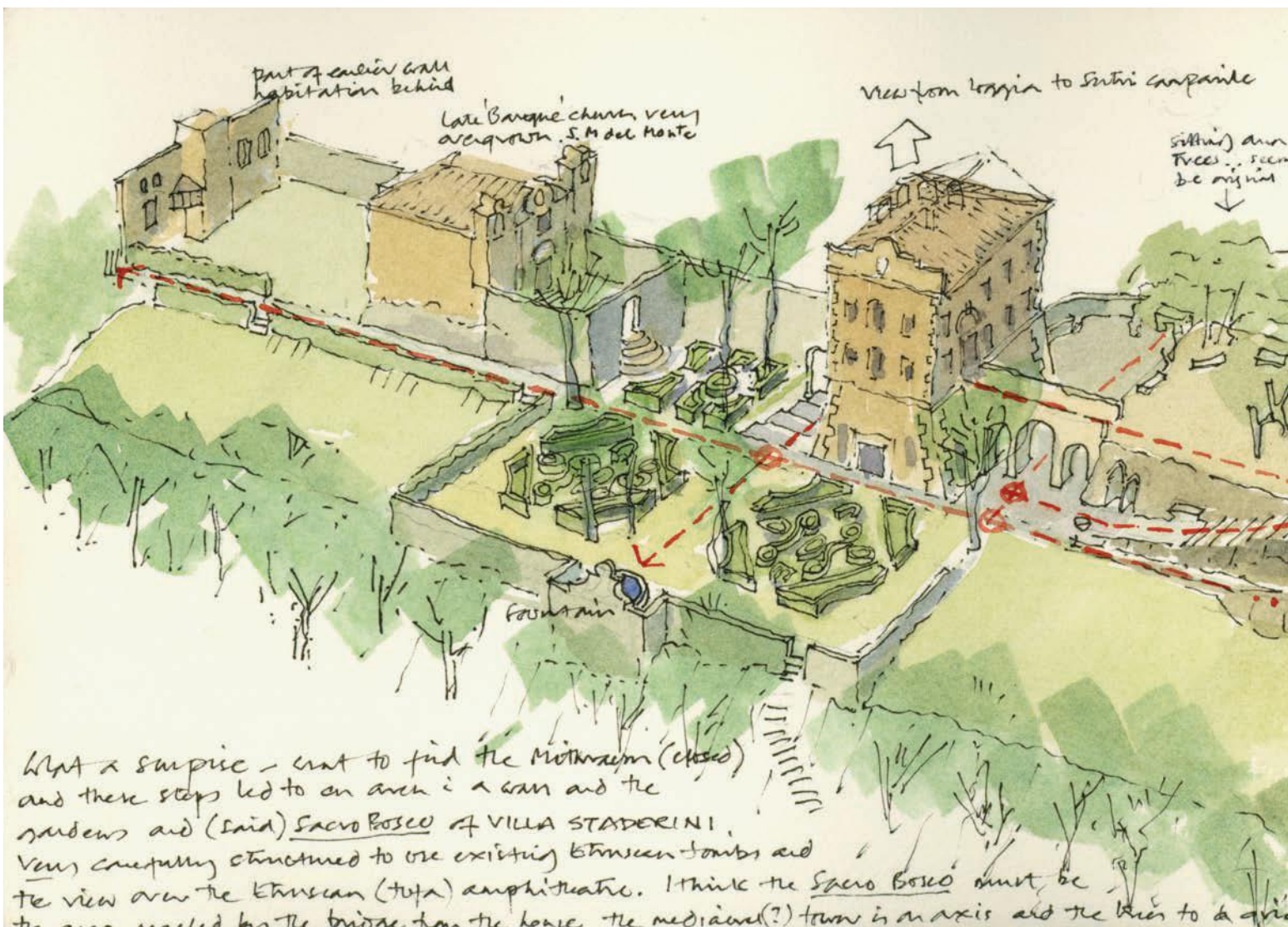
## Sketches

This section is about an architect's sketches and their uses. Sketches fall broadly into two categories. First are those that simply register the world around us, drawings that are a personal record of visual experience. These drawings may be more or less realistic. Second are sketches that come entirely from the imagination. These drawings are about finding ideas as much as expressing them. They can vary from an irrational doodle to a swift cluster of lines that synthesize a whole project or concept; a drawing that captures the whole sense of a proposal.

Both kinds of sketches are important and while sketching is not an innate ability for all architects, the commitment to visual expression in this way remains a vital skill. The observational sketch is distinct from an illustration: a good observational sketch need not necessarily be illustrative, rather it could be about selection and analysis as much as it is an accurate visual record, complementing photographic analysis in its

abstraction from detail. The emphasis of observational sketches is on thinking about the things we see, about spatial and structural organization, scale, light, colour and material. In this sense innate drawing ability is less important than an engaged and focused approach to 'thinking-through-drawing'.

Both kinds of sketches are distinct from, but are often confused with, diagrams. One of the most often referred-to diagrams is the 'concept sketch' that appears at the start of the design process. Like a diagram, this kind of drawing can be reductive in a negative way. The concept sketch is actually a modern invention that derives from the term *concetto* used in Renaissance architecture. But in contrast to the rich combinations of text and image that these ideas once referred to, today's concept sketch tends to be visually diagrammatic and simplistic in content: rather than bringing ideas and images together in a synthetic way (as in the original *concetto*) the 'concept sketch' tends to pull them apart.





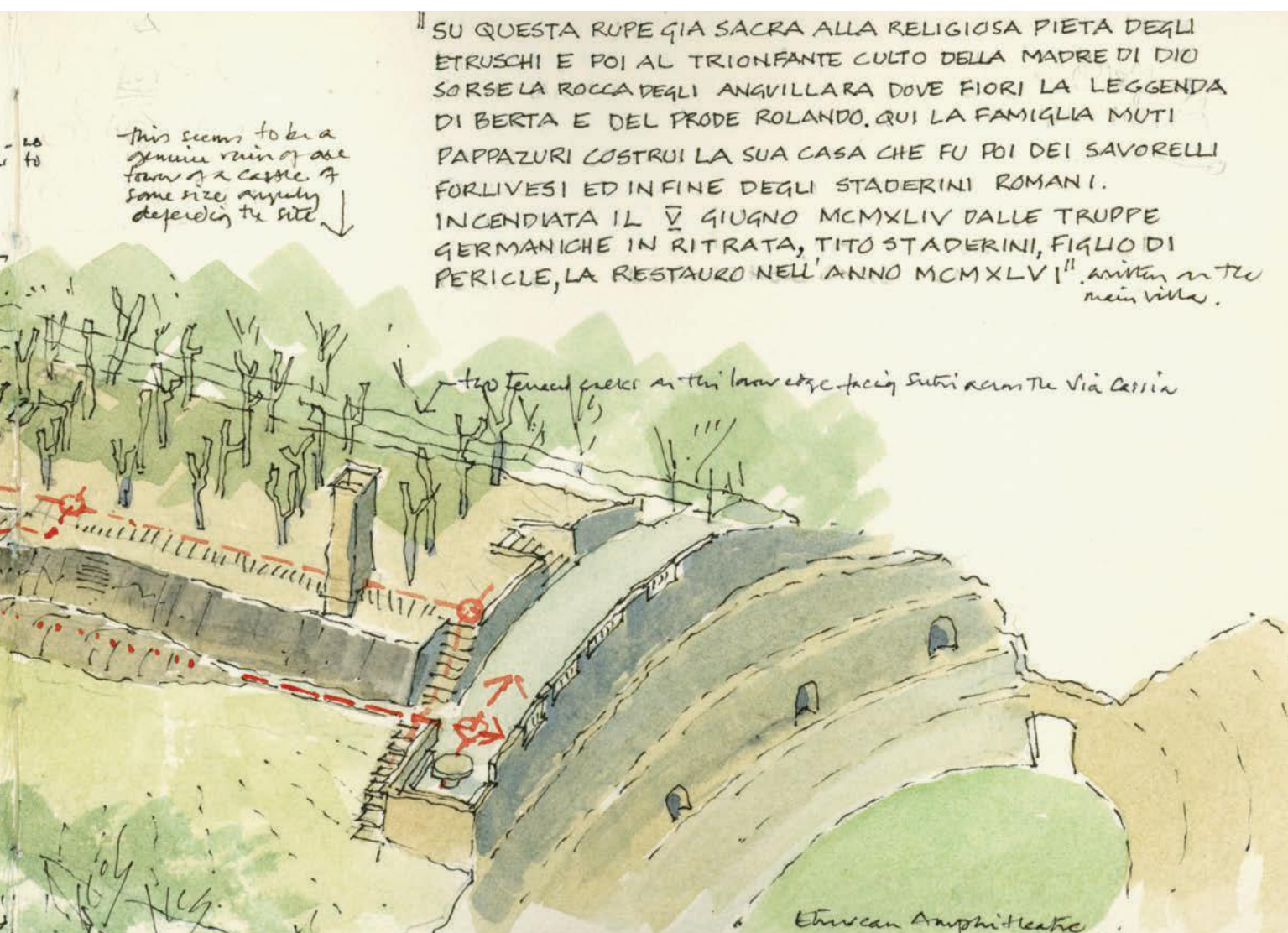
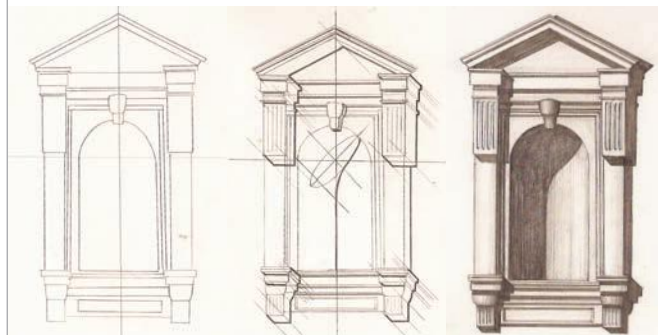
In that sense two common drawing types, the concept sketch and the diagram, are not central to the approach taken in this section. Here we are more focused on the creative potential for architectural drawing and sketches in particular, at the start of the design process, when quick drawings can represent ideas and drive forward the holistic understanding of an architectural proposal. The sketchbook is traditionally the diary of an architect's ideas and still retains a value. Here, illustrations from sketchbooks of the artist Mario Ricci and the architect Peter Sparks illustrate a narrative of ideas, using pencil, ink and watercolour wash. The sketchbook becomes a domain of thoughts, some of which will develop into further drawings and models.

#### Below

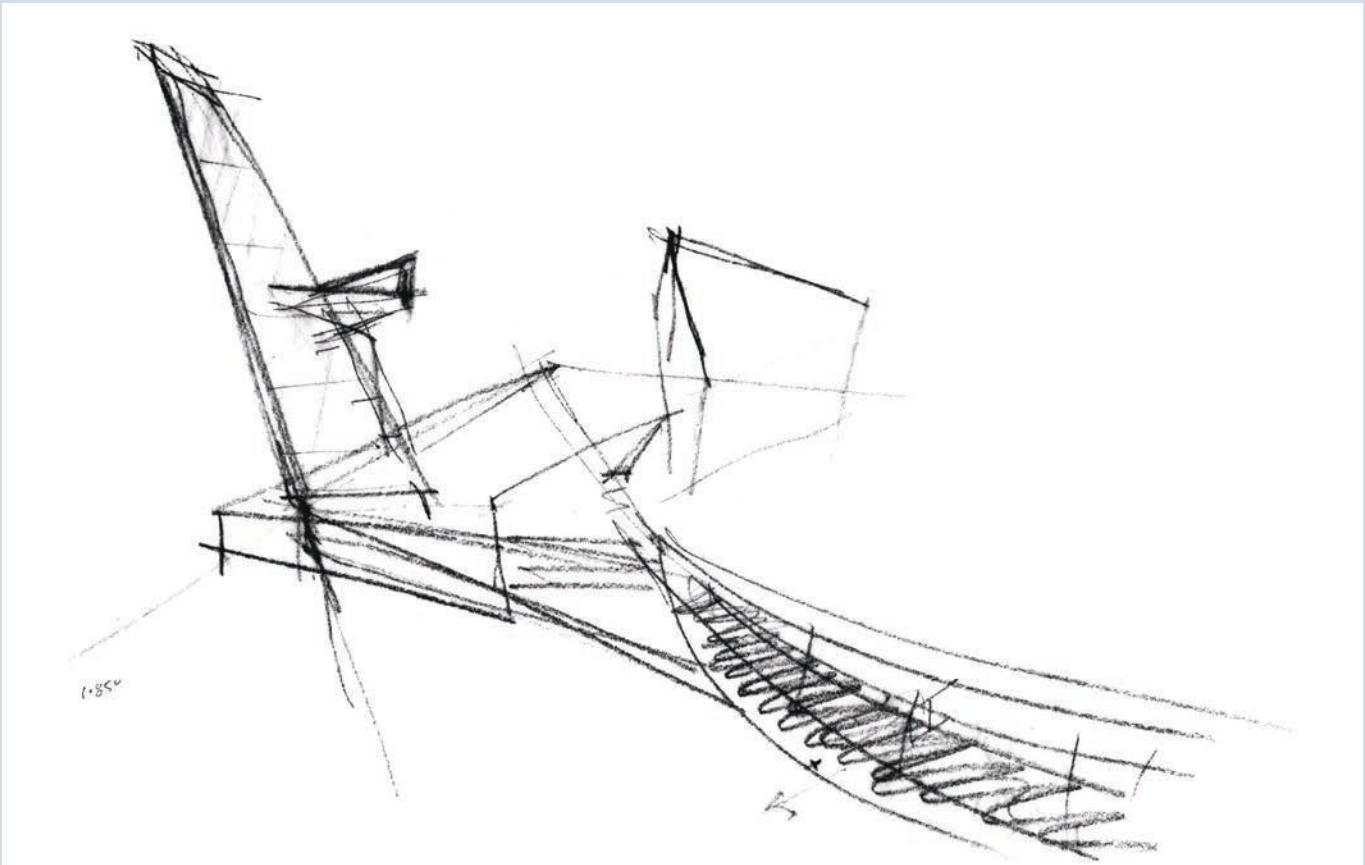
Architect Peter Sparks' highly skilful watercolour sketch isometric of Villa Staderini, Italy, illustrates how effectively such a drawing can be used to analyze a complex topography.

#### TIP SCIAGRAPHY

Simple projection can create shadows that reveal form. Keep the light source coming from one direction and project through 45 or 60 degrees.



## Case Studies: Sketches



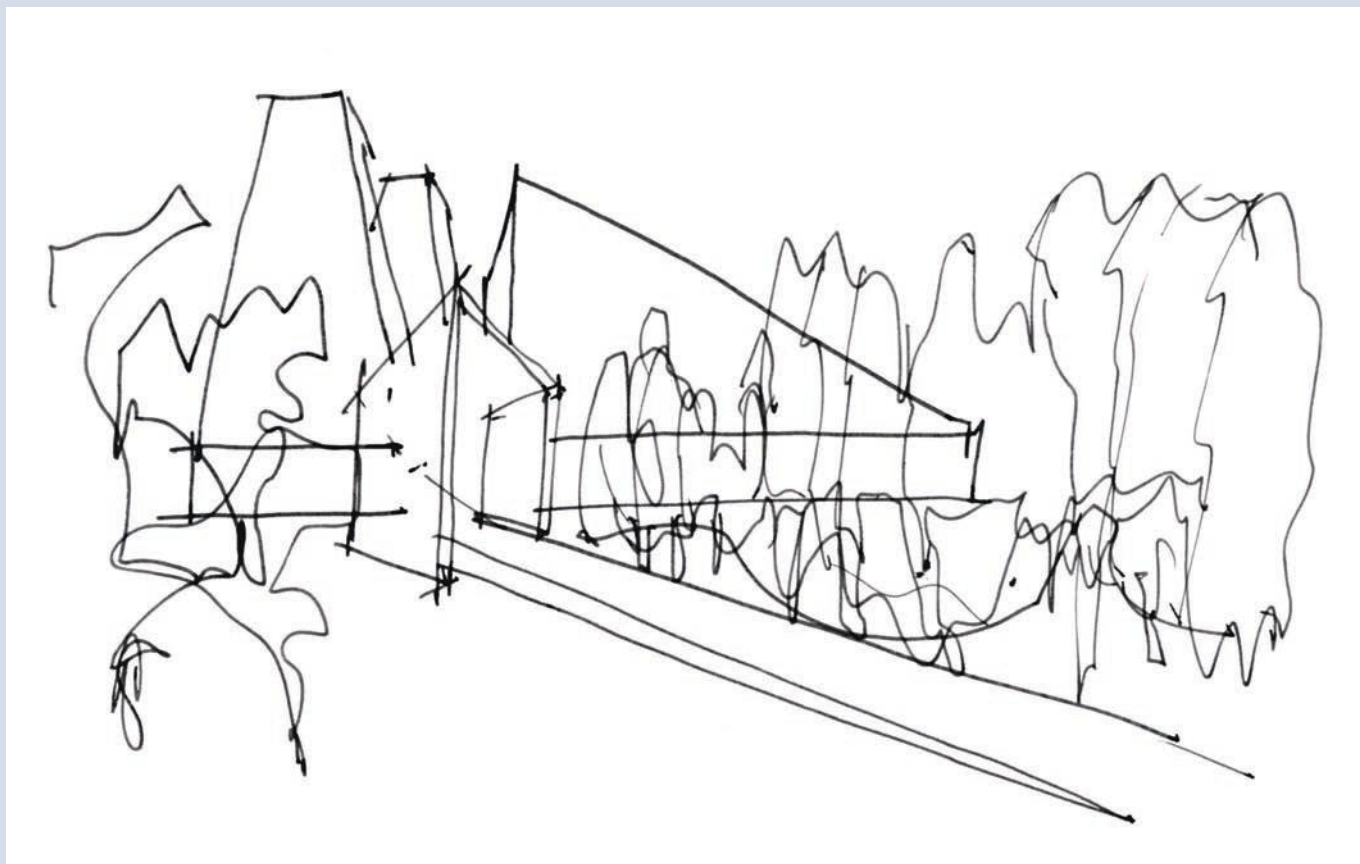
1

### TIP ROLE OF THE SKETCH

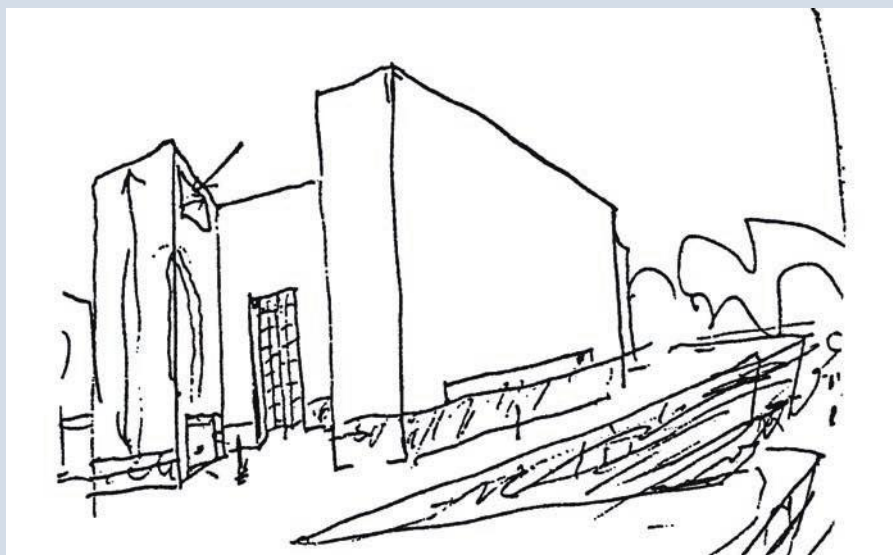
Sketch in whatever medium is to hand. Emphasize the role the sketch plays rather than the qualities of the sketch itself: a sketch should be used to observe, think or invent.

1. Eric Parry's early pencil sketch for the Southwark Gateway in London exemplifies how, in contrast to a conceptual diagram, an early sketch for a project can embody layers of ideas. In this drawing the first layer is a spatial arrangement: the perspective of a hard landscaped area first captures the sense of a place that may resist the language of street furniture, barriers and traffic chaos typical of the area. The second layer is about more formal articulation, showing an idea for a podium and inclined needle. These are ideas about townscape. Finally the sketch even implies the materiality of the landscape elements (limestone) in the coursing of the needle, and to some extent in the character of the line weights themselves. These layers of thinking come together as a synthetic sketch with a real sense of scale and order that is subsequently worked and reworked, holding together the integrity of the design from urban proposal to detail.

2,3. The perspective sketches by Eduardo Souto de Moura (above right) and Alvaro Siza (below right) are done in ink, using simple lines to capture formal arrangements of buildings that are set against the scale of the surrounding landscape. Like the sketch shown above by Eric Parry, these swift drawings powerfully establish a formal proposal that responds to both programme and context. There is a clear delineation of volumes, entrances and access, and the drawings have a sense of real precision despite the relative freedom of execution where lines overlap and perspective is distorted. The same clarity and discipline is evident in both architects' painstaking attention to detail and the material quality of their built work.

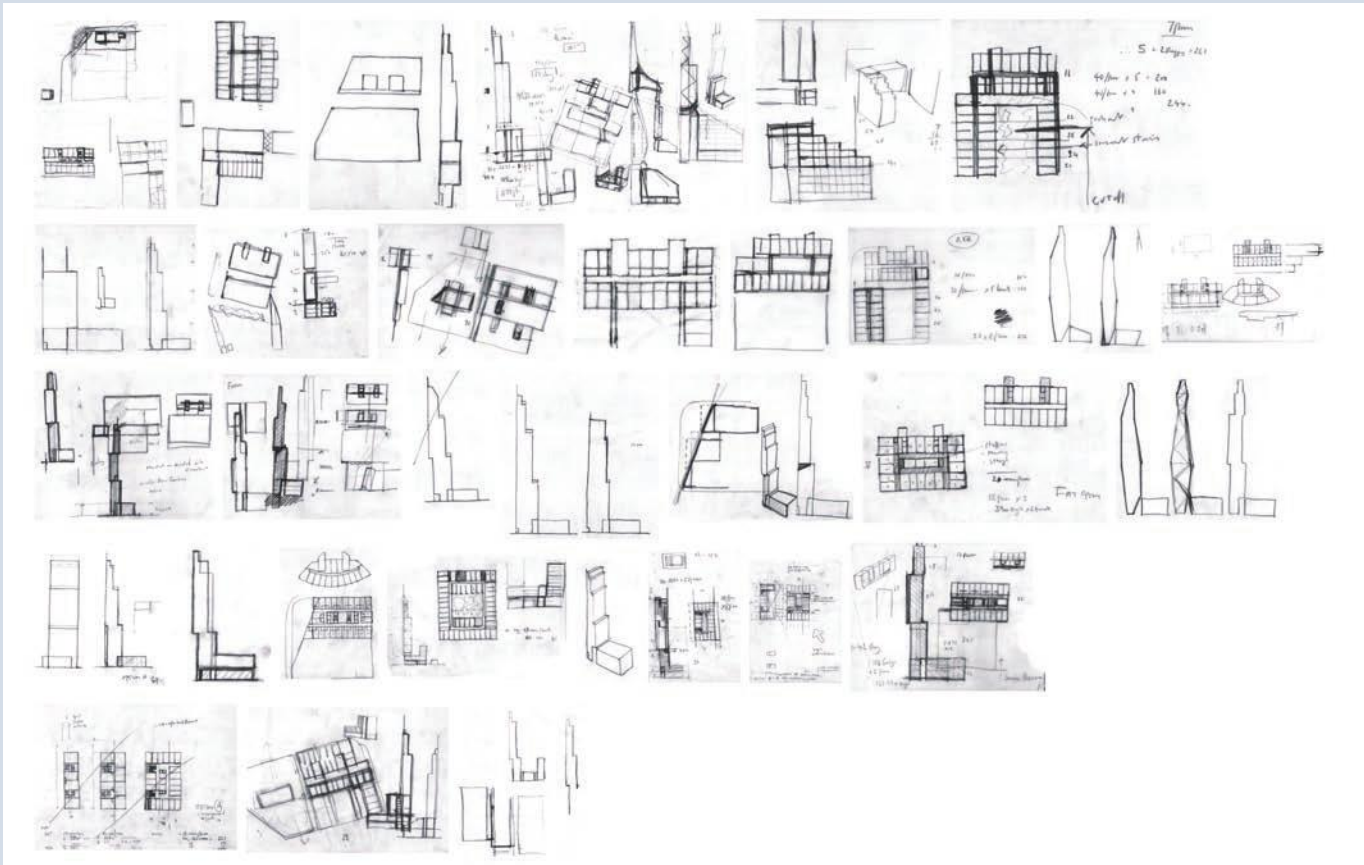


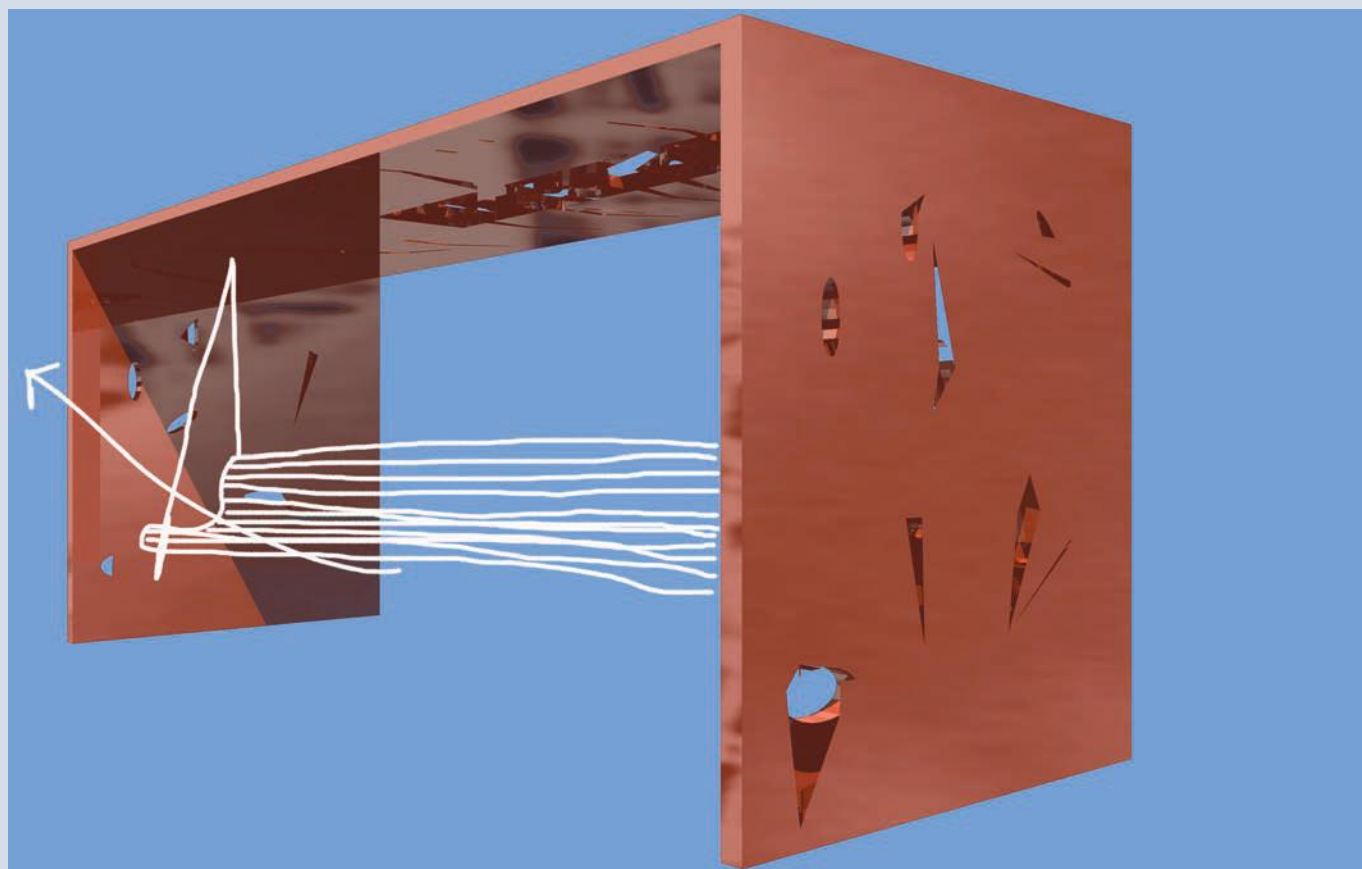
2



3

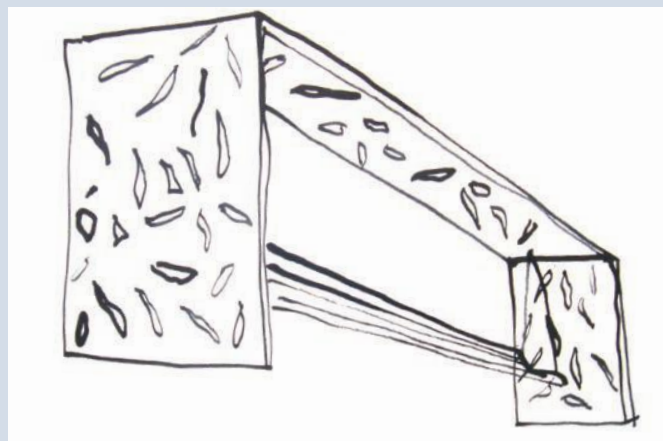






5a

5a, b. In this concept study for garden furniture Will Alsop expresses the desire to think about new kinds of garden furniture altogether. The two images show how a sketchbook study can be combined with a simple digital model. The resulting image takes the initial sketch further in that it represents colour and material qualities and sense of scale. At the same time, in keeping the hand-drawn lines of the swing seat, the computer image retains a sense of openness to the fluidity of design process. This interchange between sketchbook and sketch computer model is fruitful.

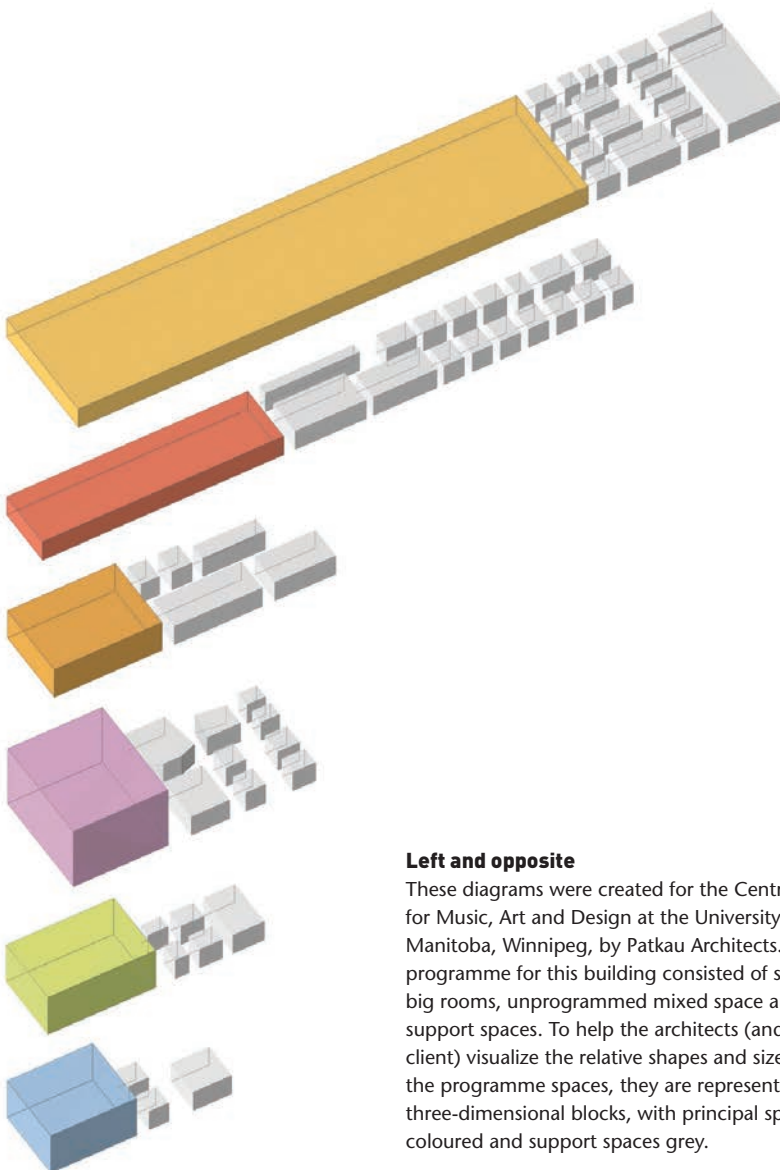


5b

## Diagrams

Given the varied nature of contemporary practice, it is not surprising that there is much debate around the use of diagrams. We read about diagram theory, the use of diagrams as drivers for thinking about architecture, and the use of diagrams historically. While for some architects diagramming has become an essential mode of designing, diagrams are generally not used as a singular mode of representation, but as a drawing type they may help us to clarify a design at various stages of its development. Diagrams can be freehand, digital or hybrid; drawing technique will depend on the nature of the thinking or analysis that the diagram is articulating.

Diagrams can help us to understand essential components of a scheme and can be used at all stages of a building, from site analysis to initial design ideas



### Left and opposite

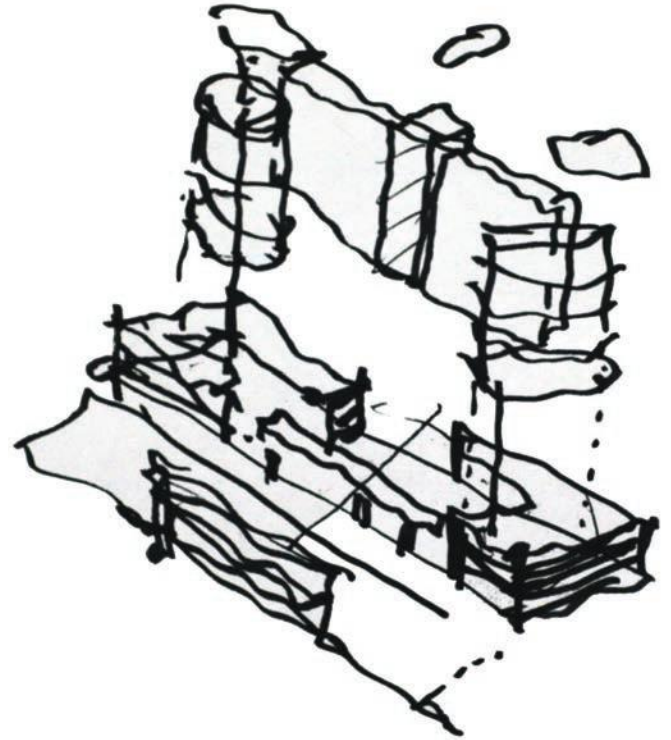
These diagrams were created for the Centre for Music, Art and Design at the University of Manitoba, Winnipeg, by Patkau Architects. The programme for this building consisted of six big rooms, unprogrammed mixed space and support spaces. To help the architects (and their client) visualize the relative shapes and sizes of the programme spaces, they are represented as three-dimensional blocks, with principal spaces coloured and support spaces grey.

The programme spaces are assembled spatially within the building to maximize possibilities for interconnection and overlap. To describe the disposition of the main spaces within the overall building, the building is represented as a transparent cubic form with the coloured primary spaces within it. Both diagrams were modelled in AutoCAD, rendered in VIZ and enhanced in Photoshop.

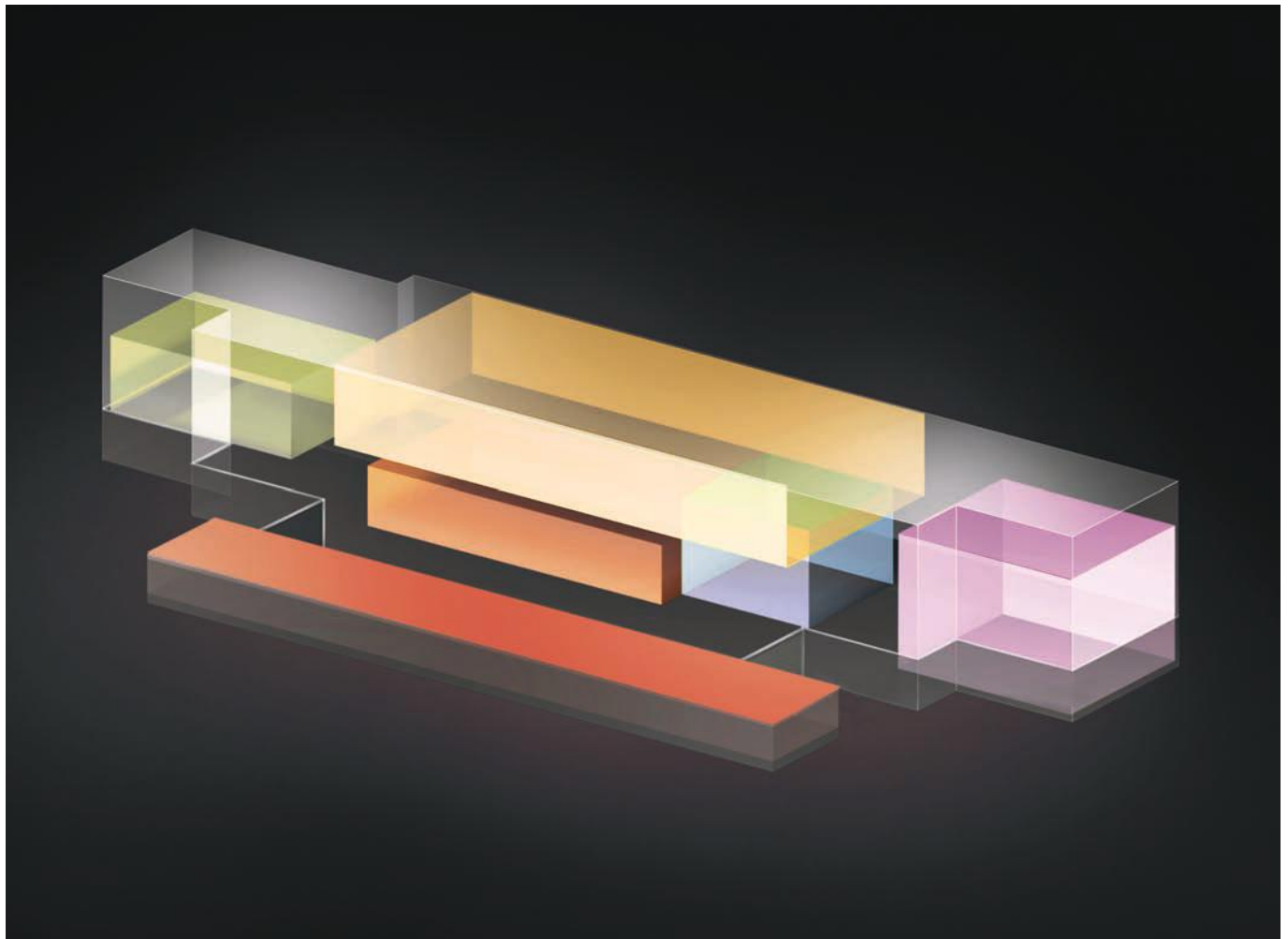


to analysis of a building itself. Diagrams can be useful because they reduce complex architectural ideas to their composite elements. They can freeze otherwise shifting relational conditions, emphasizing clarity of communication of a singular aspect of a proposal or given condition.

All diagrams are characterized by a high degree of abstraction. They compress or otherwise distil information. Diagrams are a way of exploring one facet of a design and do not attempt to represent the full complexity of an architectural strategy or proposal. Like plans, sections and other drawing types, they convey information through graphic conventions. Diagrams tend to draw on a wide variety of techniques such as colour coding or graphic symbols, and text will further explicate the visual message.

**Right**

An exploded isometric sketch in ink illustrates key building elements.





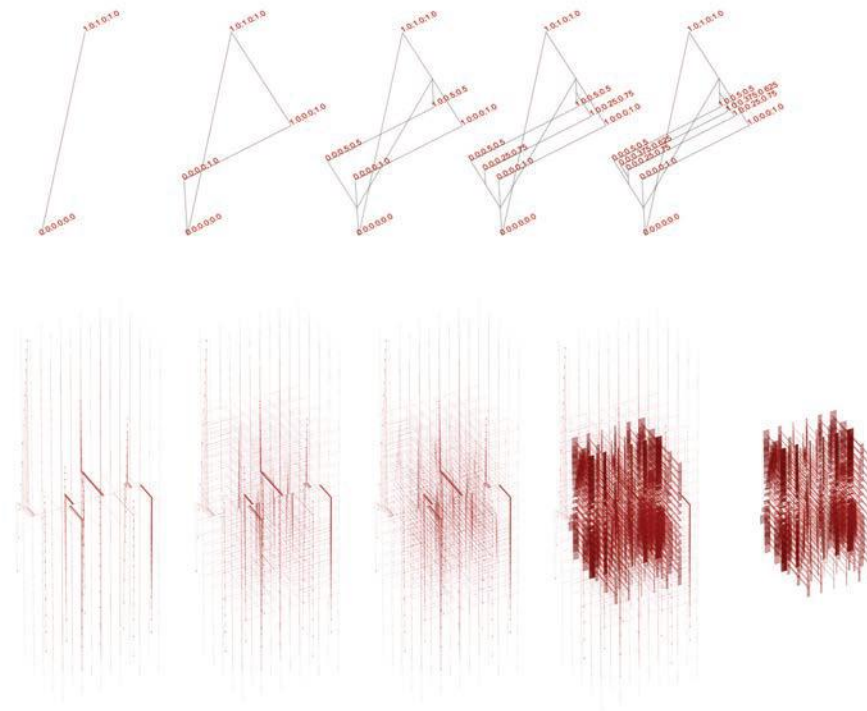
### Above

This diagram is part of a project by Sophia Cole for a municipal archive at The Mount, Princes Risborough, UK (see pages 122 and 179). It is a table containing each component of the façade and its material. The components are in the order of construction on site.

The base line work for the drawings was taken from a 3D model created in Rhino; this base drawing was then added to with more detail in a 2D plane within the same program. The line work, when complete, was edited in Adobe Illustrator to improve its quality. Finally, the

images were taken into Photoshop where a number of textural images and scans were used to describe the textural quality of the building.

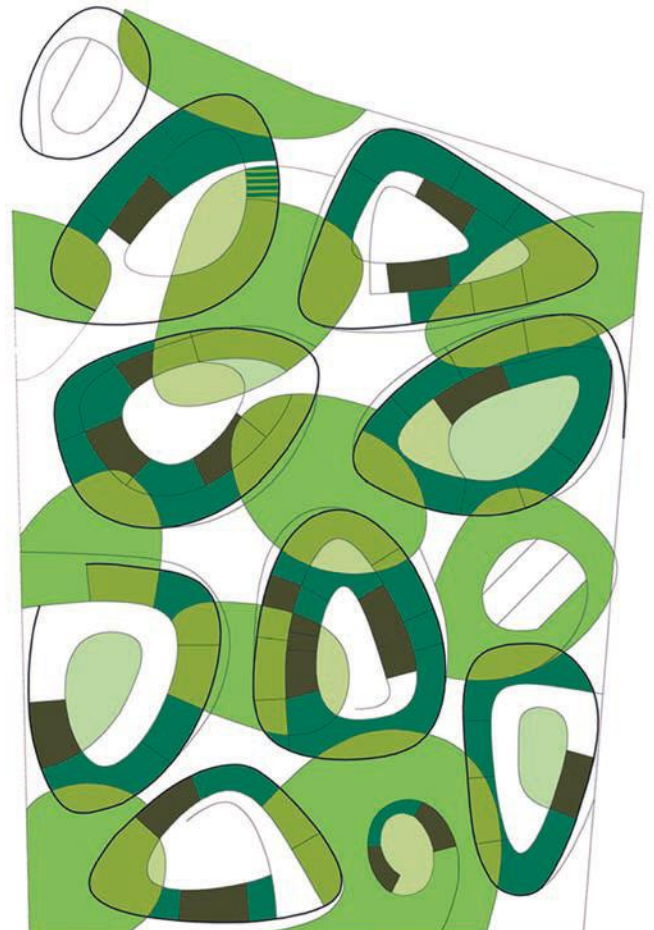


**Left**

Scripting and digital models generate their own kinds of diagrams.

Diagrams are as varied as the ideas they can potentially display, but essentially fall into three categories. First are reductive diagrams, the kind that are used at early stages of the design process, when a complex range of conditions and restraints come together as layers of information to be synthesized by the designer. Here, the diagram helps us to distil what is important. This kind of reductive diagram can help us to prioritize, and understand key drivers for design. Second are generative diagrams. These are isolated notions that are drawn to illustrate key generative principles of the design. Finally, there are so-called mechanistic diagrams that replicate the design thinking and complex illustrations of abstract, often formal, ideas that produce a final design.

All these kinds of diagrams are forms of shorthand. They convey a partial narrative and are, at best, an informative 'scaffolding' for the final proposal. Diagrams help us see part of the picture, as do other kinds of drawings: what is important here is that any one drawing type is not seen in isolation.

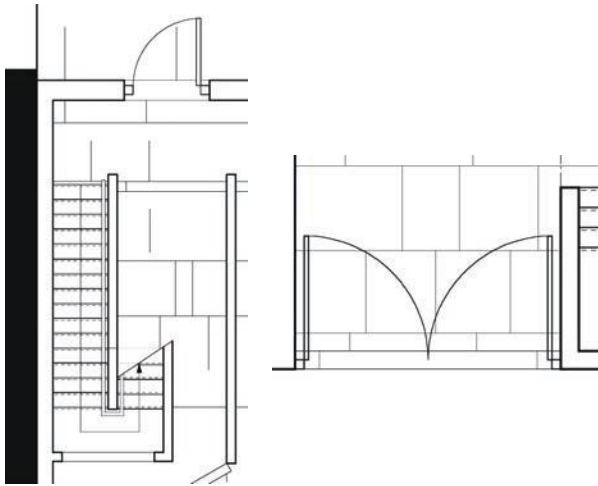
**Right**

Colour and shape can play a key role in making a clear diagram. Here, colours are overlapped to give a clear sense of the landscape represented.



## TIP CONVENTIONS FOR PLANS

- Show everything that is seen below the plan cut (typically taken at 1 m (3 ft) above floor level).
- Differentiate between elements that are cut in the plan with heavier line weights.
- Elements that are not cut, but which are visible, should have a lighter line weight.
- Significant elements that are above the plan cut (i.e. not visible) should be shown dotted.
- Voids to floors below the plan are indicated with crossed lines.
- Voids to floors above are shown with dotted crossed lines.
- Arrows on stairs indicate upward direction.
- Like walls, stairs are cut where the plan is taken.
- Show doors in open position.



## Plans

A plan is a fundamental architectural drawing type. It is a primary organizing device. As a consequence it is the central drawing to a great many projects, and is the drawing through which buildings can most easily be read. At the same time, it is only one part, albeit a significant one, of a whole range of drawings that eventually describe a building in detail.

Technically a plan may be described as an orthographic projection from the position of a horizontal plane. The position of this plane and the scale of the drawing can produce a wide variety of plan types, ranging from landscapes to details. The scale of the plan drawing is important in determining not only the level of detail illustrated, but also the graphic style. For instance, a detail drawing whose purpose is solely to convey information may be appropriately carried out in line, while a plan of a city or landscape may be rendered to indicate topographic information or, in the case of a city, internal and external space. Together the scale and drawing technique of a plan will play an important role in determining what it communicates.

In most projects the plan may be described as something of a 'hinge', the element about which other drawings turn and the element from which springs a range of spatial studies. If the plan does not work, both pragmatically and within the frame of the overall intention, then other drawings are inevitably compromised.

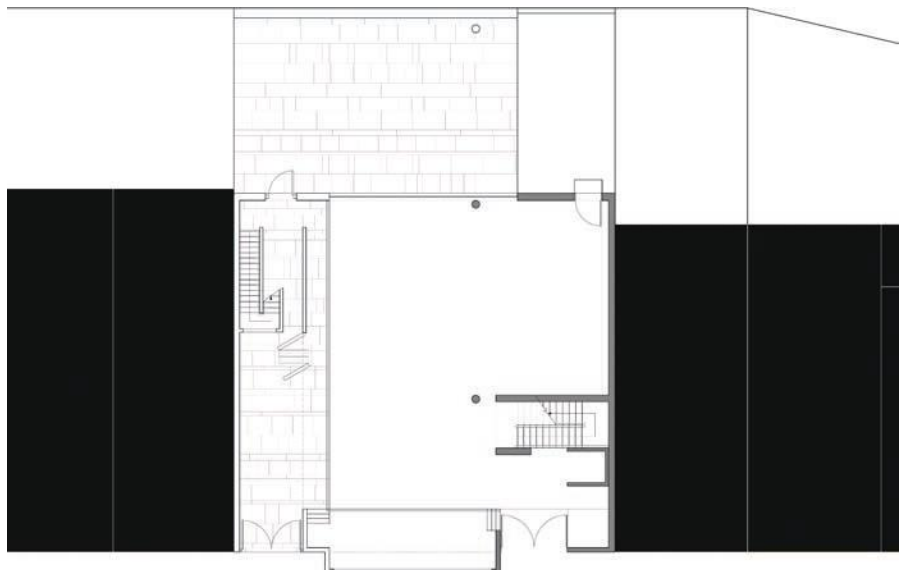
For plans of buildings, the plane of the floor plan is taken a little above, and parallel to the level of, the floor it describes, so that the projected drawing looks straight down onto the floor plane. Of the conventions that govern building plans, the most important concern graphic style and line weights. The key purpose of a plan

### Right

Line weights differentiate elements in the plan, such as walls. These can either be shown as heavier lines (as used on the left side of the plan) or solid filled lines (as used on the right side of the plan).

### Opposite page

An urban plan showing various ways of rendering the proposed internal and external space. Note the effect of different wall treatments and how a subtle introduction of colour (at bottom) can highlight the new space (garden) created by the 'L'.



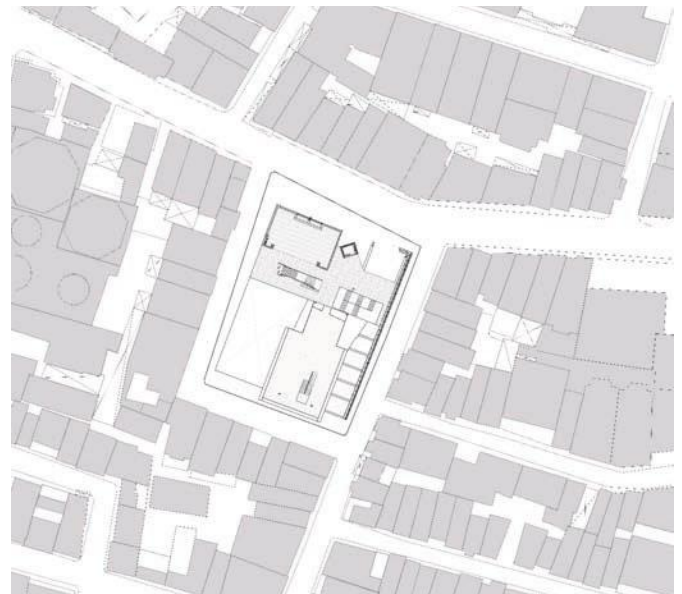
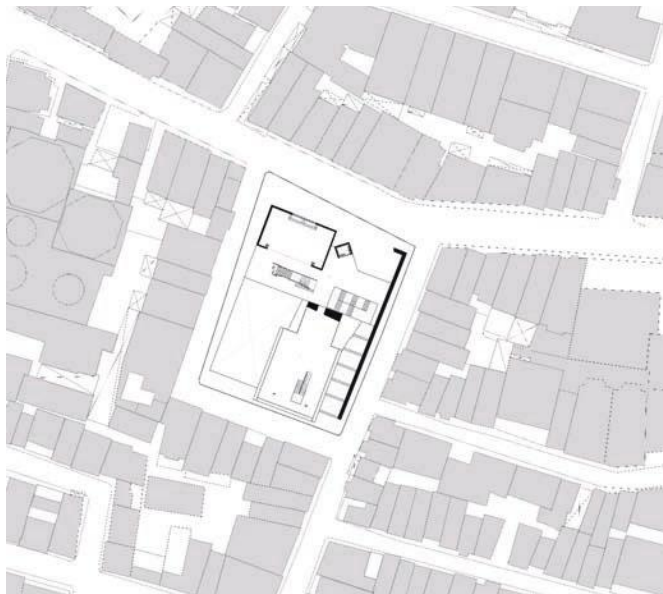
drawing, in particular, is to communicate information and the key elements of a plan are the vertical planes it cuts through. These can either be shown with a heavier line weight or by rendering the insides of cut walls. All other lines that are visible below the line of the plan are drawn in a lighter line, and significant parts of the building that appear above it (a staircase or ceiling plan, for example) are typically drawn as dotted lines.

In contrast to the conventions that have traditionally governed building plans, other kinds of plan drawings can be more exploratory and wide-ranging in their use of technique, evocative in the role they play in generating ideas for the three-dimensional development of the building as a whole. Other kinds of sketch plans are spontaneous and capture the essence of an arrangement.

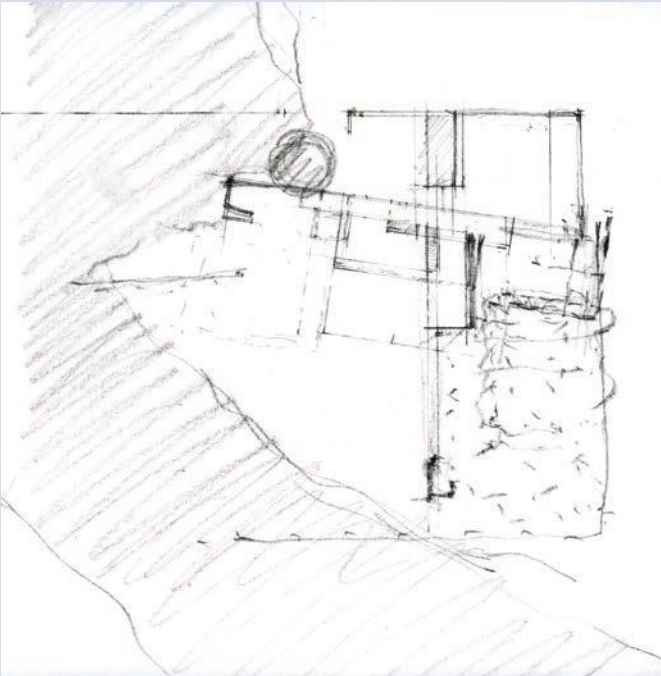
This kind of drawing is deceptive. Though it is quick in its execution, it requires a real understanding of dimension that comes from experience of observing, measuring and drawing existing spaces and objects – measured drawings retain a real value.

### TIP SCALE

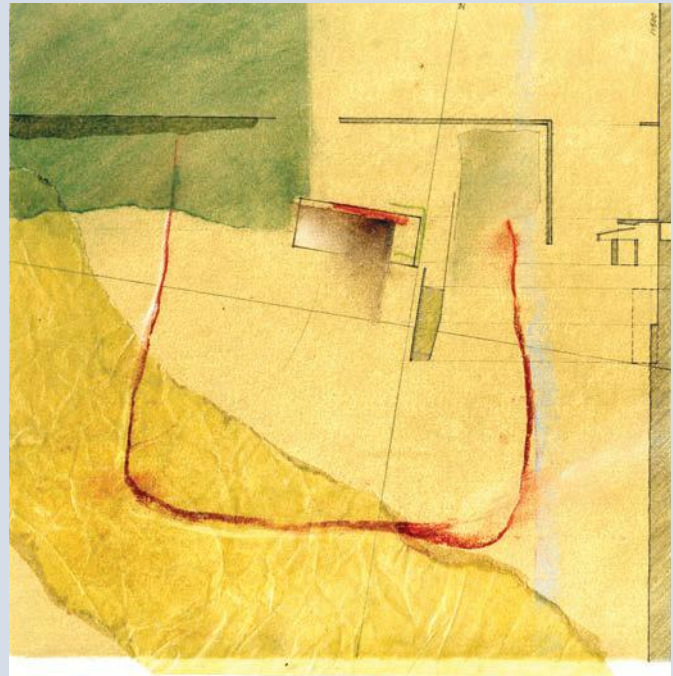
Above all else a plan should convey information clearly. Always draw a plan to a specific scale (or at full scale in CAD). The conventional scales are 1:10,000; 1:2,500; 1:1,250; 1:500; (landscapes/urban contexts) 1:200; 1:100; (overall buildings) 1:50; 1:20; (individual rooms/details) 1:10 and 1:5 (details).



## Case Studies: Plans



1a

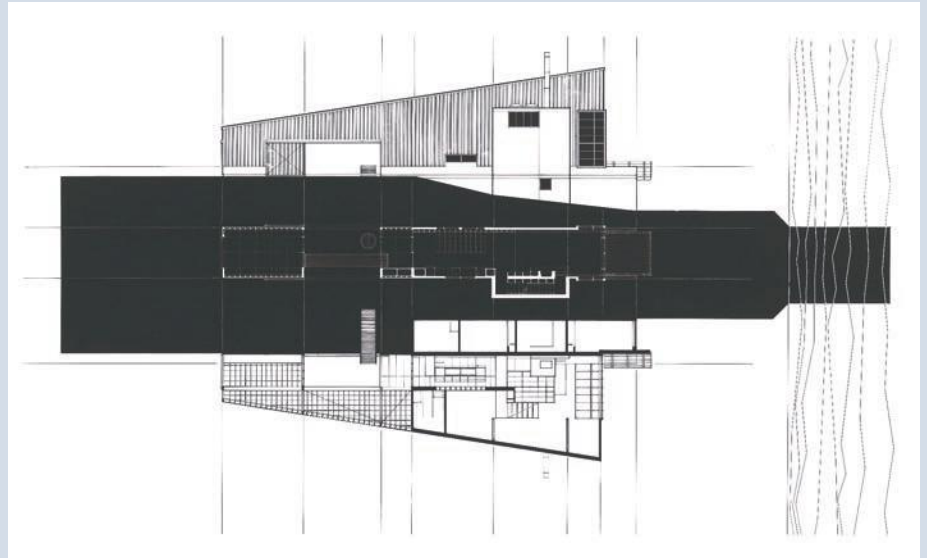
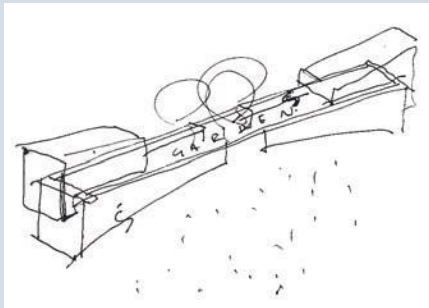
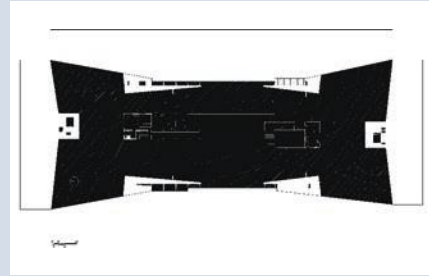
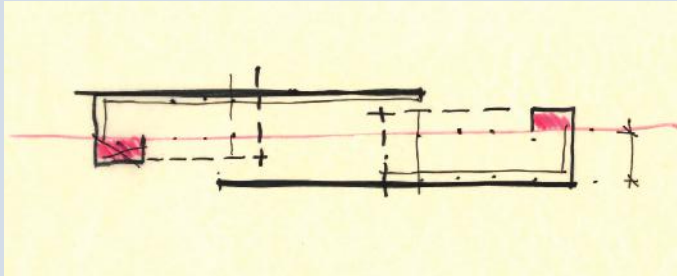


1b

**1a.** The idea of a plan as a creative device is no better illustrated than in Philip Meadowcroft's sketch plans for a residence. Here two plans are illustrated as a sequence. The first is an expressive drawing on tissue paper in soft pencil. It shows how the architect's first ideas of a spatial arrangement are translated into their preliminary visual form. There is a wonderful range of line quality between sharply ruled lines through to construction lines, fine lines that represent openings or transparent materials, to firm marks that indicate mass or structure. Into this plan can be read layers of thinking that range in scale from the articulation of the hearth to its location in a landscape. The differential line weights annotate, with a variety of intensity, a complex three-dimensional thinking within the conventions of an abstract plan. What is particularly skilful here is that the expressive drawing retains a precise sense of scale (1:500) and this is key to the reading of the overall drawing.

**1b.** The precision is further developed in the subsequent plan drawing on coloured layout paper. Here, the drawing takes on a material quality, to reflect the importance of the landscape to the overall strategy. From a mid-tone plane of pale yellow, the drawing uses colour and texture (paper creases and pastel) to differentiate tonal background and imply topographic depths. Walls are hatched and ruled as articulation of detail becomes more definite and at the same time the drawing, in the contrast between the precision of the hatched structure and freehand lines of pastel and torn paper edges, conveys a sense of the built and the natural.



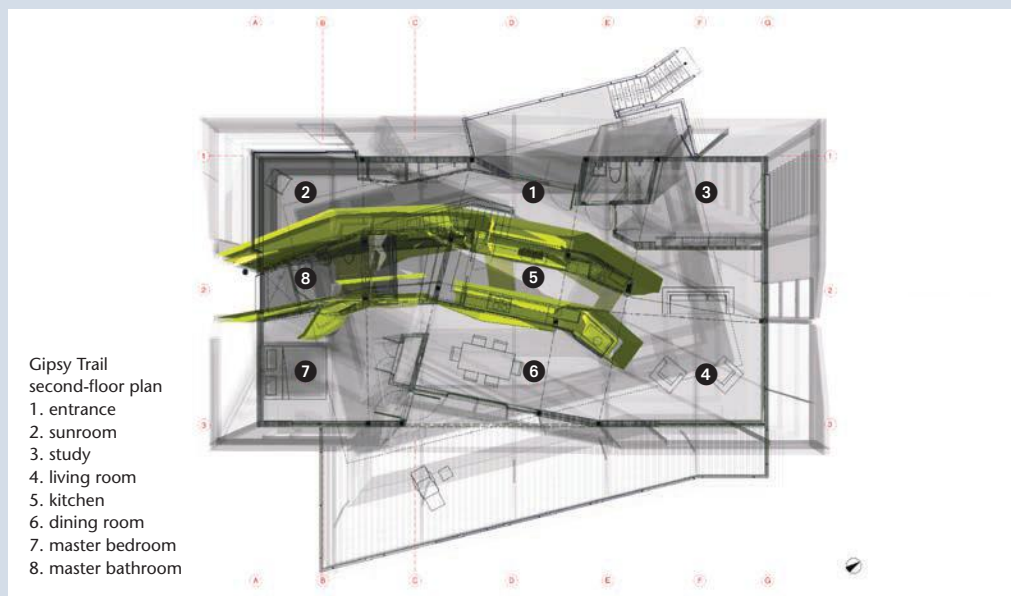


### TIP DOTTED LINES

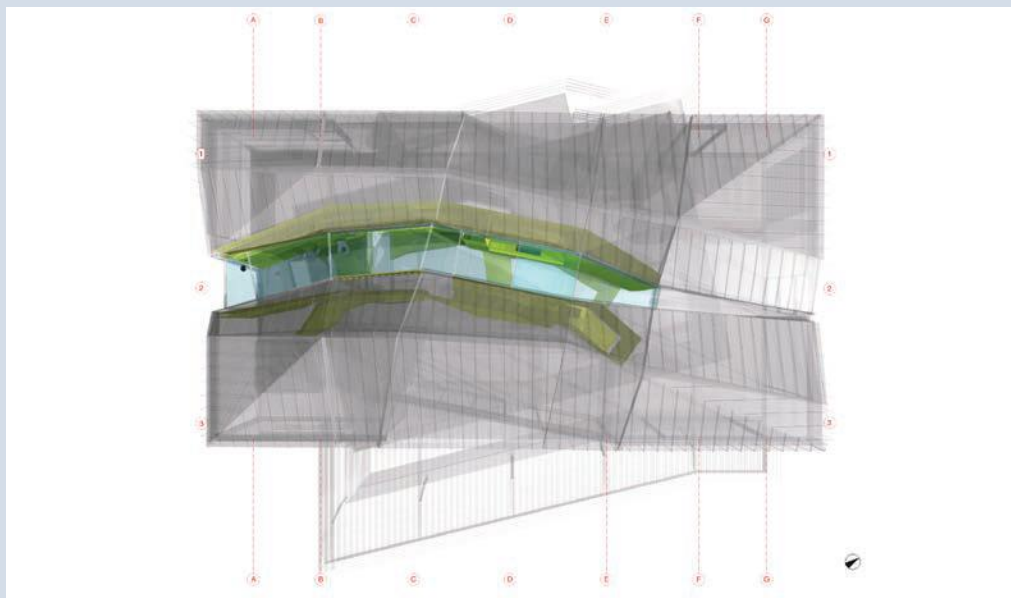
Dotted lines on plans indicate significant elements above the plans view. Crosses on plans indicate voids.

2. MacKay Lyons' drawings (top right and bottom right) illustrate a different kind of plan, but also the consistent development of similar early sketches (top left and bottom left) into final drawings and built form. The architect's plans of the Hill House (top right) and Howard House (above right) are interesting compositionally, combining a simple plan, reversed out (white on black), with elevations and sections. These are engaging graphically and

the story of the house unfolds as each section of the drawing, some parts of which are rotated, is investigated. Because of the strong graphics, the drawing attracts attention from a distance and then offers further information, as the intriguing composition invites a detailed study. The bold strategy is appropriately monochromatic and in tune with the well-judged formal arrangement of the buildings themselves.



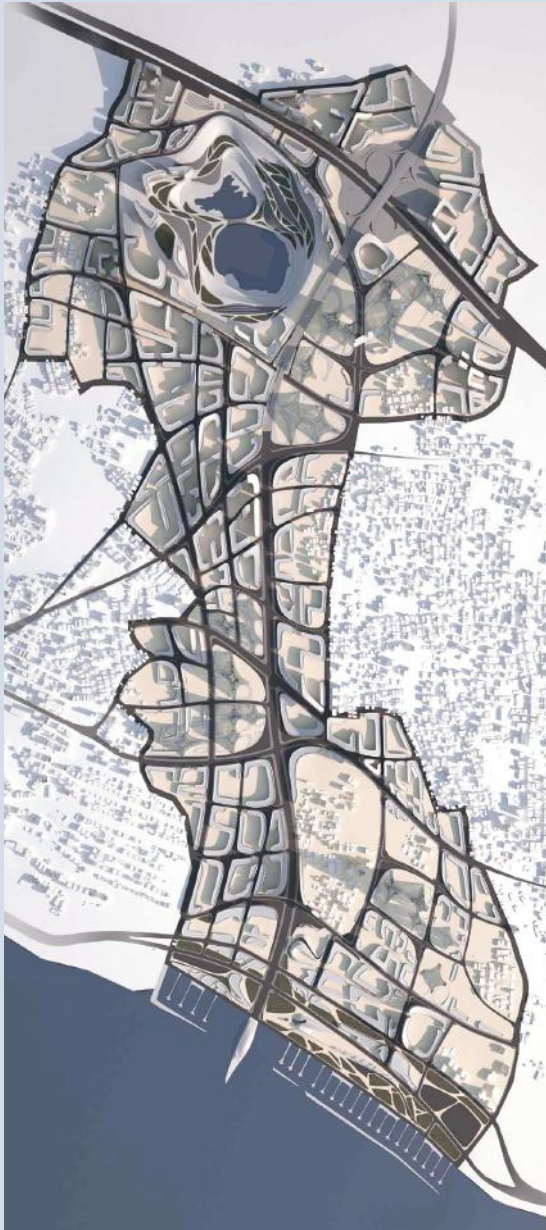
3a



3b

**3a, b.** The plans for Archi-Tectonics' Gipsy Trail Residence at Croton Reservoir in upstate New York are expressive of an architectural intention. The form of the plan responds to a rocky, lakeside landscape and the idea that at the 'generative core' of the house would be an 'armature' which integrated kitchen, bathrooms, fireplace, heating and cooling systems, and a central music system. The combination

of transparent layers and perspective and orthogonal plans then translates ideas of interdependent layers (wall–glass–roof–glass–armature), efficiency of use (armature as infrastructural core) and negotiation of means (interior/exterior, source of sunlight) into an evocative three-dimensional plan that is both informative and suggestive of the landscape, transparency and 'responsive living'.



4

4. Zaha Hadid Architects, Kartal-Pendik masterplan, Istanbul (see also pages 126 and 189). The masterplan uses subtle tones and shadows in the render to differentiate between the existing and proposed structures.



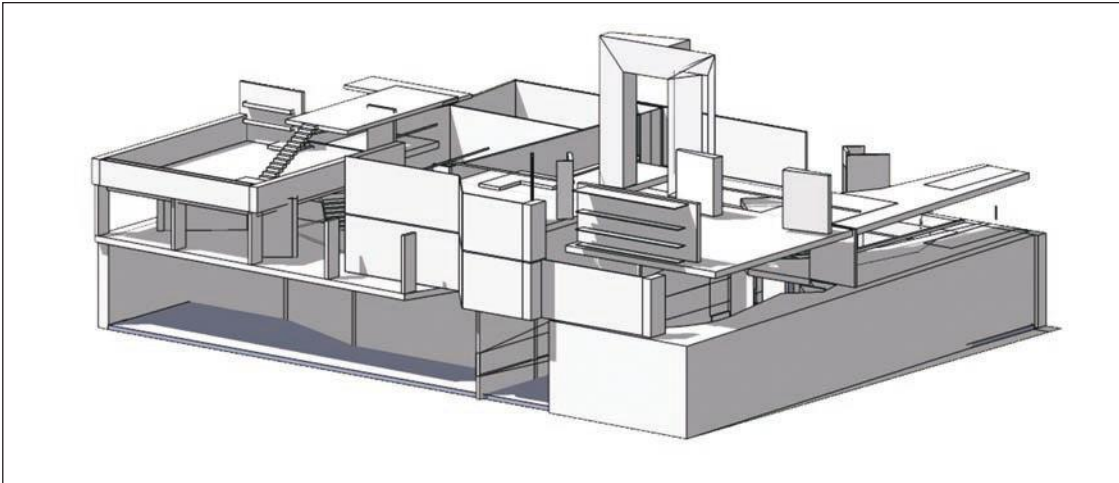
5

5. Sara Shafiei and Ben Cowd (Saraben Studio). These plans for a market building are partly drawn and partly modelled using laser-cut watercolour paper. The shadows that are created in this way convey a rich impression of the spatial arrangement. The overlaid line drawings clearly communicate other information and clarify the location of this part of the plan with reference to the whole proposal.

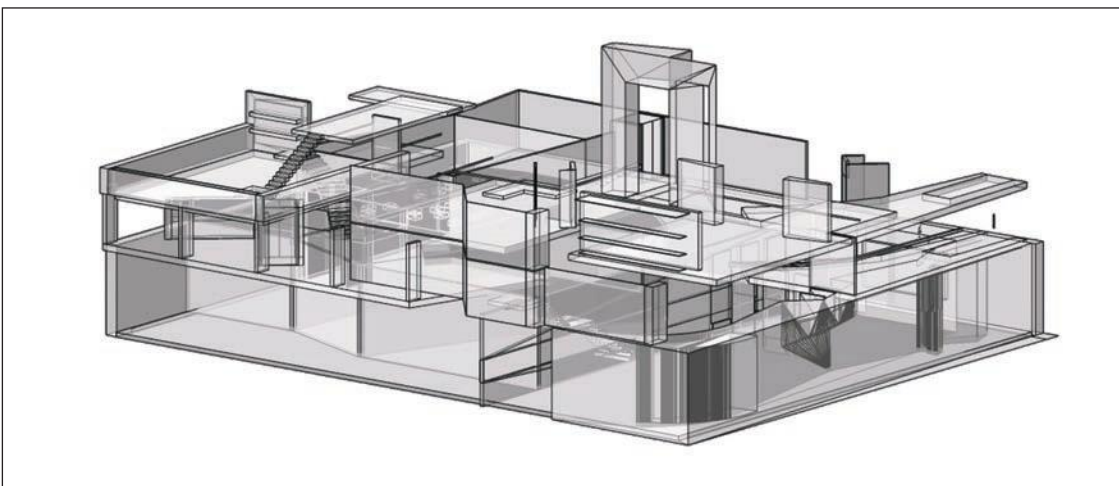


## STEP BY STEP GRAPHIC OUTPUTS IN SKETCHUP

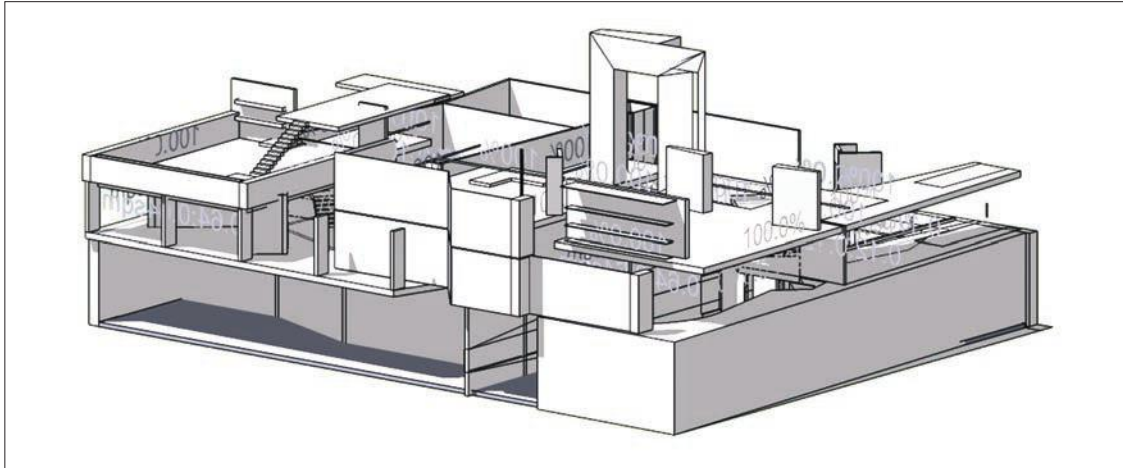
This section shows illustrations of typical projections that can be taken directly from a CAD model. In this case, simple models in SketchUp are taken from 'camera views', isometrics, aerial perspectives, elevations, orthogonal plans, perspectival plans and orthogonal and perspective sections. A similar function is typically built into all CAD software.



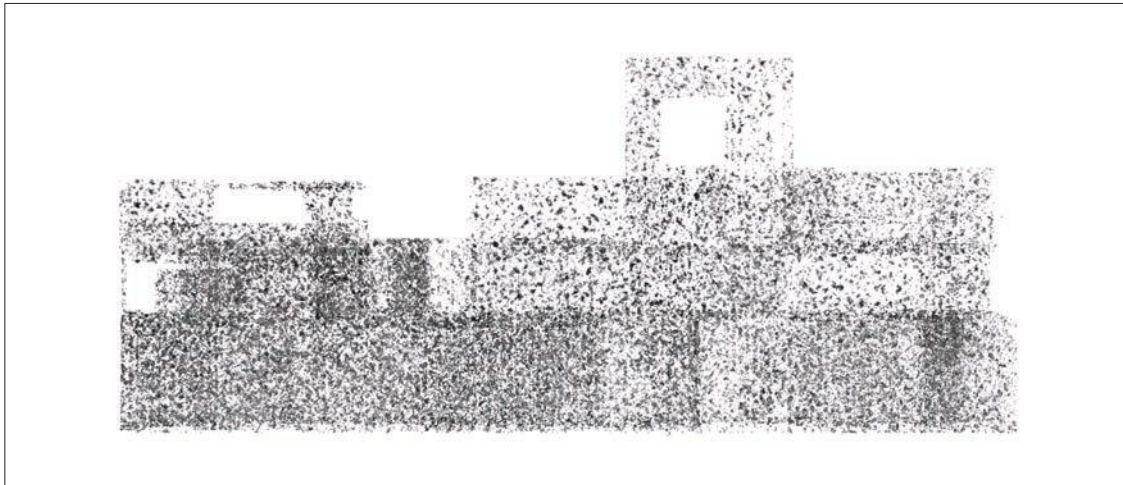
1 Graphic Output 1: Shadows.  
View>Shadows.



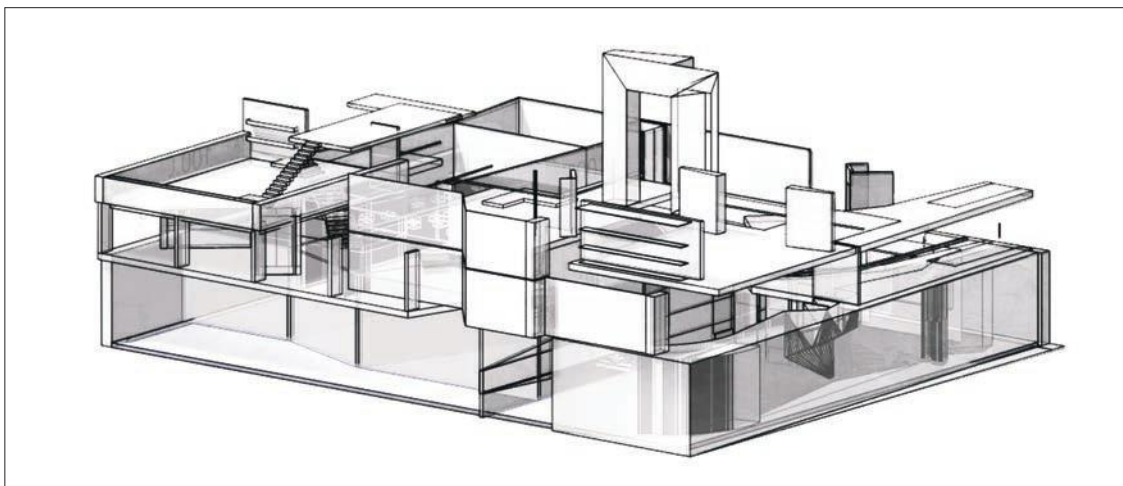
2 Graphic Output 2: X-Ray.  
View>Face Style>X-Ray.



- 3 Graphic Output 3: Shadow Calculator.  
SketchUp plugin Shadow Projector calculates shading in relation to selected surfaces.



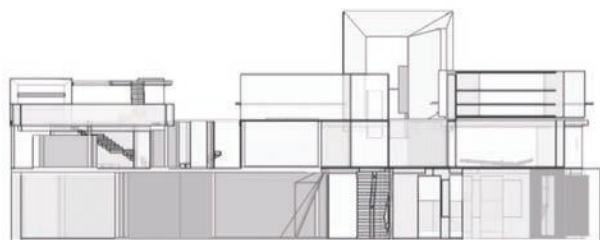
- 4 Graphic Output 4: Simple render produced in Kerkythea utilizing wireframe procedural.



- 5 Graphic Output 5:  
A combination of outputs 1 to 3 overlaid in Photoshop.

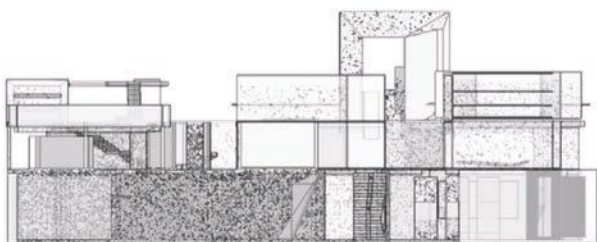
## STEP BY STEP EDITING SKETCHUP'S GRAPHIC OUTPUTS IN PHOTOSHOP

The following stages, drawn by Maria Vasdeki, illustrate how an orthographic view, taken from a standard SketchUp model, can be imported into Photoshop and overlaid with context and material texture. This is a quicker process than modelling in detail, and an effective way of exploring ideas in context during the design process. Working with layers means that both model and context can be changed as the design develops.



- 1 All outputs discussed on pages 112–13 were placed in a Photoshop file.

From the X-ray output, only the notable interior parts were preserved, while the Shadows output covered the rest of the structure.



- 2 The Kerkythea output was then imported in the file, preserving only the areas that would not cover the notable interior and external components of the structure.

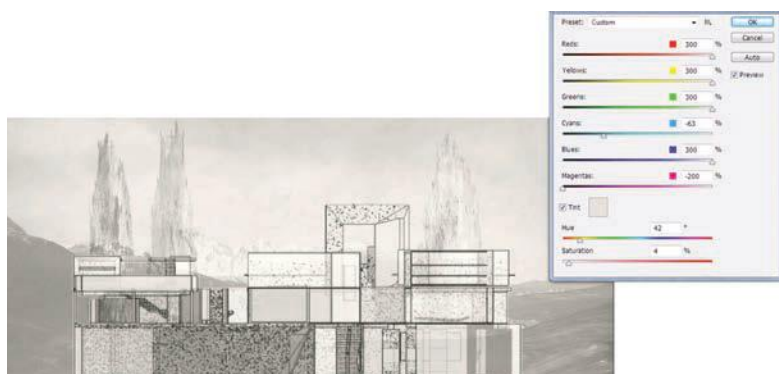


- 3 The sky and landscape layers were placed under all output layers, and their Fill values were set to 75% and 39% respectively.

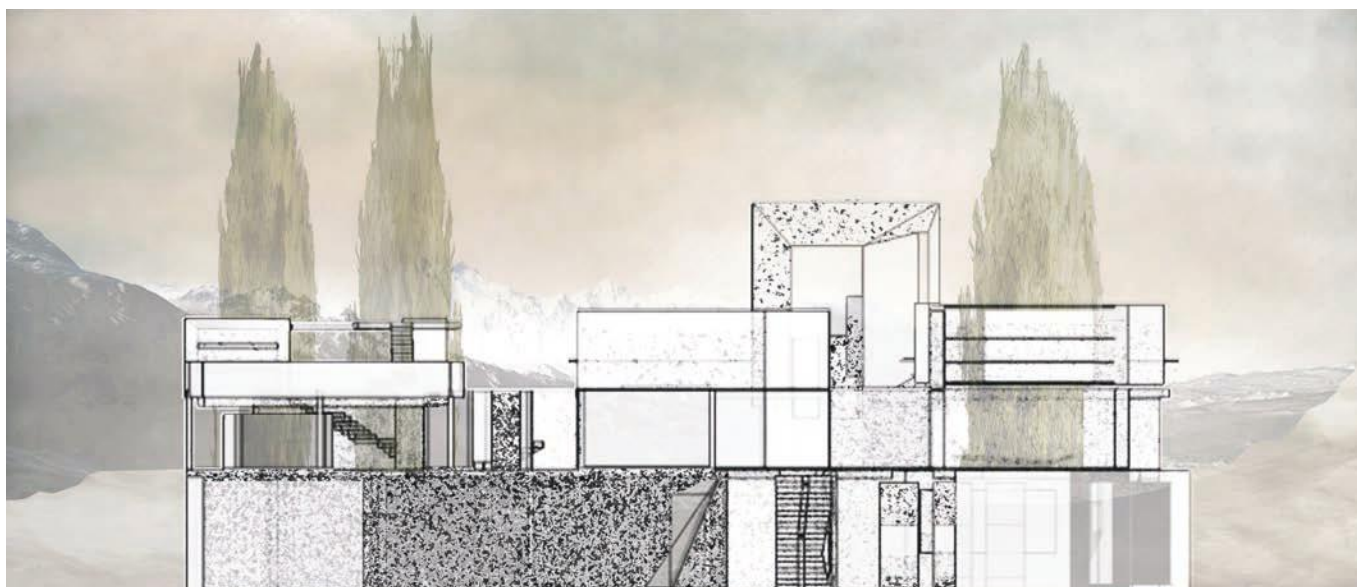




4 The trees were added under the Kerkythea output layer.



5 The image was flattened and the new Background layer was duplicated and desaturated using the Black and White adjustment box. Its Blending Mode was then set to 'Soft Light'.



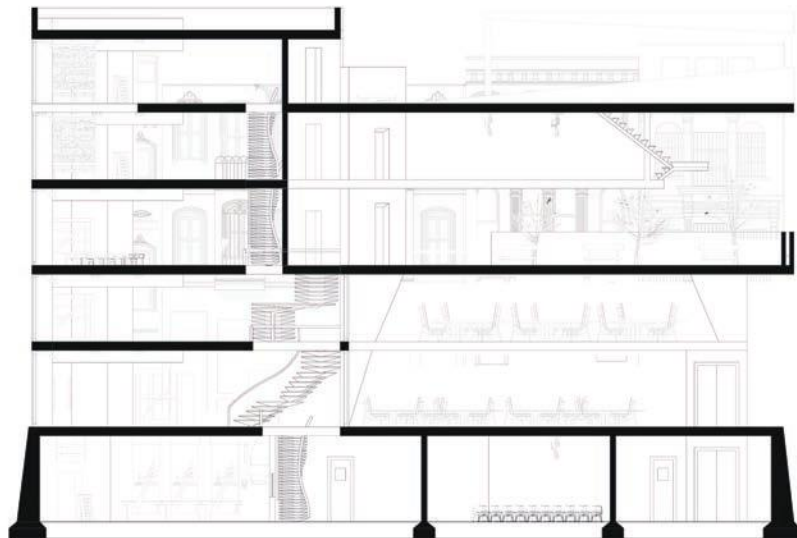
6 More detail was then added to the background, and minor colour corrections were applied.

## Sections and elevations

Sections can be extraordinary drawings. Like plans, they can be the abstract bearers of information, showing heights of rooms, floor thicknesses and constructional details. But a section through a building also embodies a rather special set of conditions: a section presents the ‘verticality’ of a building: it shows how the building sits with respect to the earth and how it meets the sky. More than any other drawing type, a section declares how the building admits natural light, and describes the thicknesses or transparencies of external walls. Interiors are described in terms of their material surfaces, their depths, passages and transitional spaces. Above all, a section is a ‘grounded’ drawing: on an uncluttered page a section can be among the most powerful of drawings to describe the organization of space.

Like a plan, a section is an orthographic projection, but from the position of a vertical plane. Sections can be cut anywhere through a building, but tend to be taken where there is a significant spatial condition to describe. Internal elevations will appear between floor plates and an external elevation appears in a section where the vertical plane is taken from outside, or partially outside, of the building.

A section generally offers itself to more elaborate rendering than a plan, partly because of the elevations that are described, but also because a section is a key drawing to describe the way in which light works in a building. In rendering light conditions and material textures internally or externally, the section can convey a concrete sense of the proposal.



### Right and opposite

Sections are important drawings that can be used to show spatial and structural organization, scale of interior and exterior rooms, relationship to context and light, and sequences of movement through a building. Here are just four of the many ways in which a section can be rendered in order to emphasize one or more aspects of the building. The top image (this page) includes line work that shows the context visible through the glazed walls of the interior. The bottom image adds render in selected areas to draw attention to key spaces in the building. Opposite, the top image is rendered to explore light and shadow, emphasizing the interdependence of natural and artificial light. The bottom image is a perspectival section, which gives a sense of spatial depth and sequence.



How contextual a section is depends on the scale of the drawing. At a large scale a section can describe a building's relationship to a whole landscape or a city. A landscape section highlights changes in ground level but is otherwise not the best drawing to describe garden or landscape context, as in a section it will only appear in elevation. On the other hand, an urban section can be an important key drawing, since it will show the scale and proportion of internal and external spaces, and how public and private space is mediated by a vertical layering of the building.

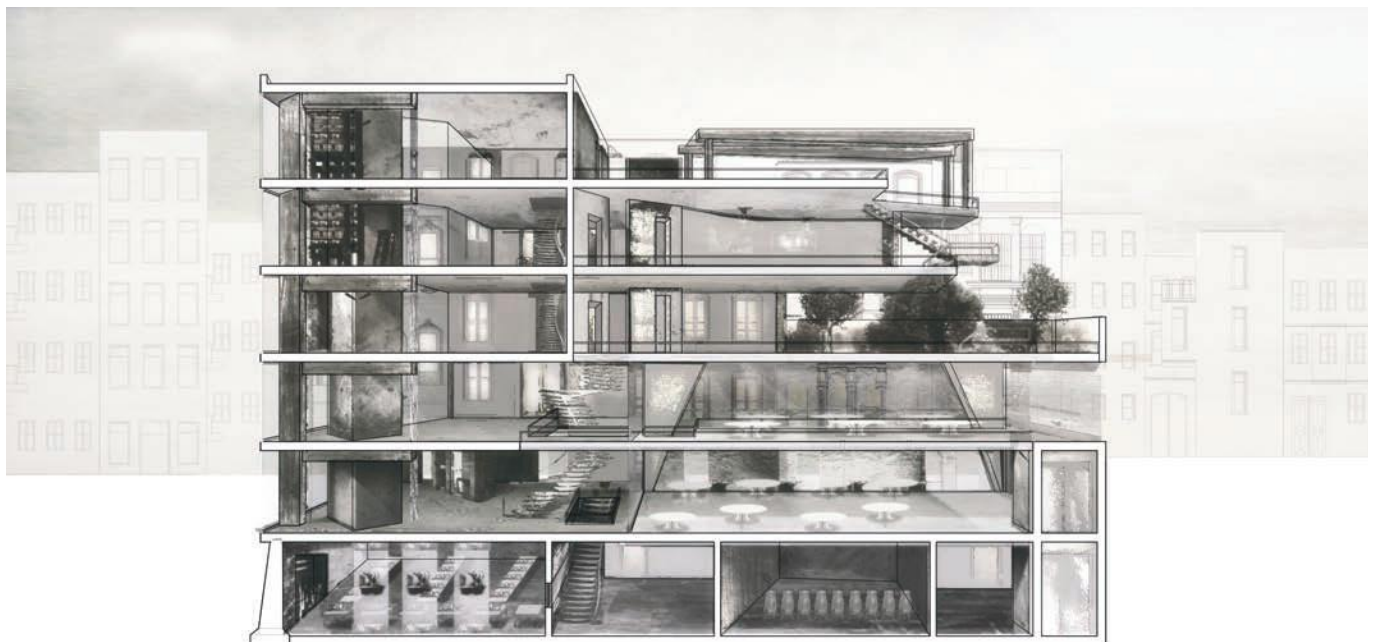
Detail sections are fundamental to conveying construction and technical performance; these kinds of drawings are about clarity of information and are drawn with precisely calibrated line widths.

### TIP PLACING A SECTION

A section is best located at the bottom of a sheet. Don't draw anything above it; it should represent a transition between ground and sky.

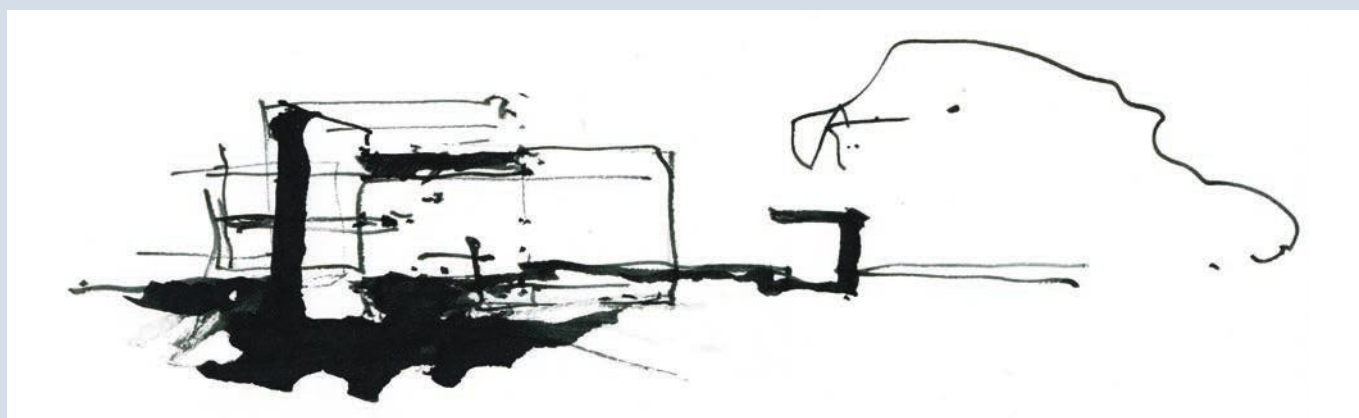
### TIP SECTIONAL CUT

Key to a section is the definition of sectional cut. Take the section through significant spaces, not through structure or secondary circulation spaces.



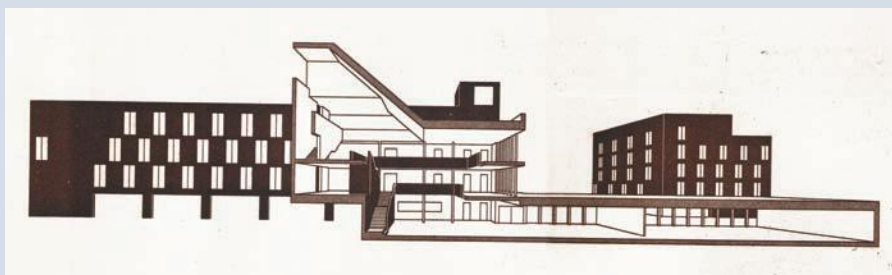


## Case Studies: Sections and elevations



1

1. The first sectional drawings featured above are by the London-based architect Philip Meadowcroft. Both are rapidly drawn sketches, direct expressions of thought translated into fleeting lines on paper. In the first pencil drawing it is remarkable how such a minimal group of lines so powerfully describe a sectional strategy. It portrays a stepped landscape, with a building form cut into it. A garden, framed by a dark wall (possibly a hedge), addresses a walled garden. There is little more than an essential set of sectional ideas that describe the verticality of a garden room, and the light and materiality of a landscape setting.



2

2. Architects Buschow Henley have developed a photographic etching technique for printing CAD images as etchings using an aquatint process. The images produced have a beautiful, soft quality otherwise unattainable by straightforward plotting.

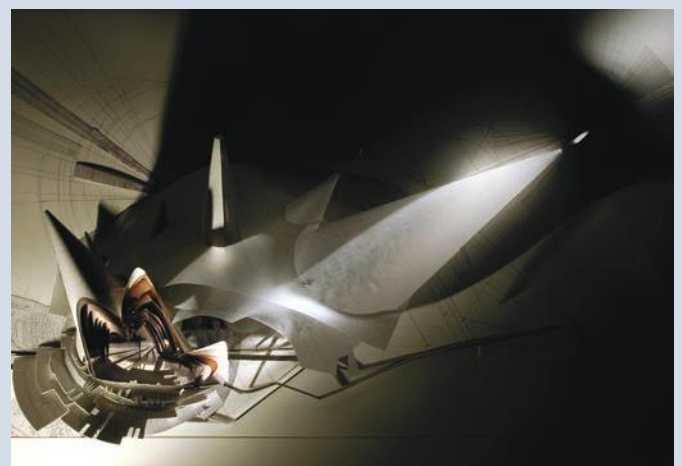
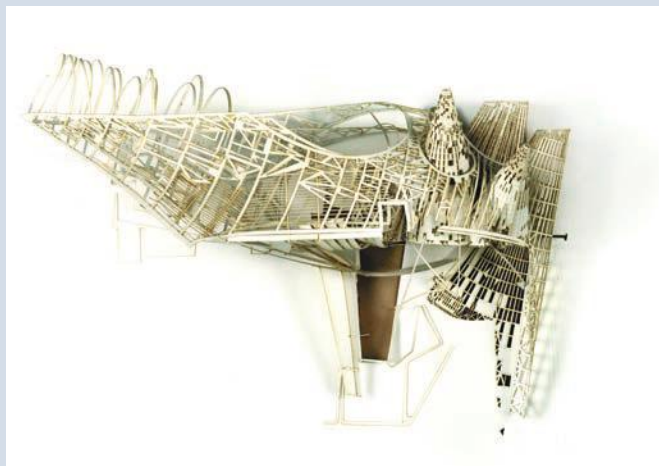


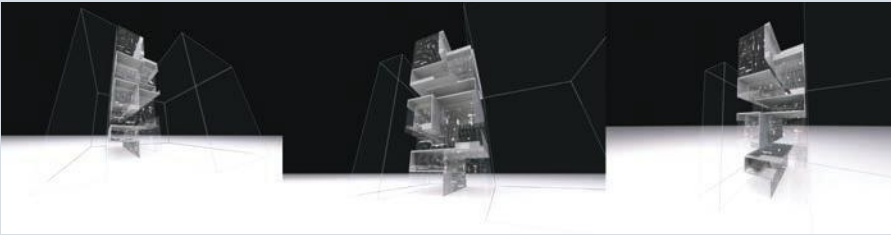
3. Equally sensitive is the elevational section for Chetham's School of Music, Manchester, by the architects Stephenson Bell. These drawings are work-in-progress, but illustrate a stage in a useful design cycle. Production started with the combination of developmental sketches and Microstation drawings in order to develop the three-dimensional massing and proportions. The drawings were then imported into Photoshop where they were tested in terms of materiality and light and shade.

4. A section elevation by Hodder Associates of their proposal for St. Catherine's College, Oxford. It successfully represents the building in its context by combining a simple line section with Photoshop collage. The effectiveness of such drawings depends on the use of filters and masks to tone down photographic context.



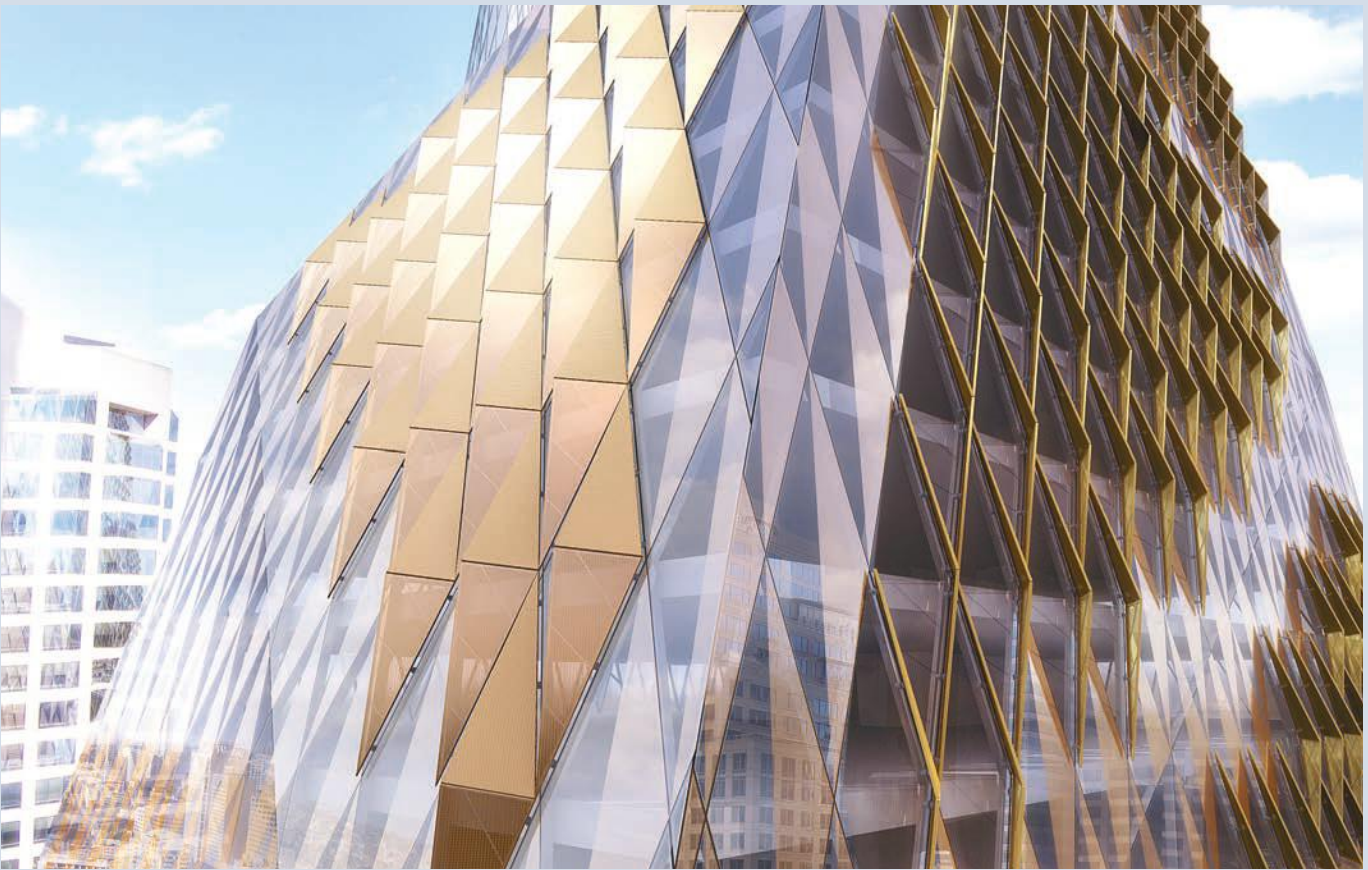
5. Sara Shafiei and Ben Cowd (Saraben Studio). Magician's Theatre, National Botanical Gardens, Rome. Elevational and sectional studies. Media: tracing paper/hand-drawing.





6

6. The sectional perspectives of Archi-Tectonics' Vestry Street residential infill project, situated in New York's Tribeca district, show how the section can be developed as a key tool to express specific ideas about a project. The form of the project was generated by a response to the varying building heights along the street. It was articulated as an overlapping of suspended and cantilevering volumes, here cleverly portrayed through a sequence of elevational perspectives that show how the floor plate, which folds in section, forms the elevation as a pattern of solid and transparent (pixelated) planes.



7a





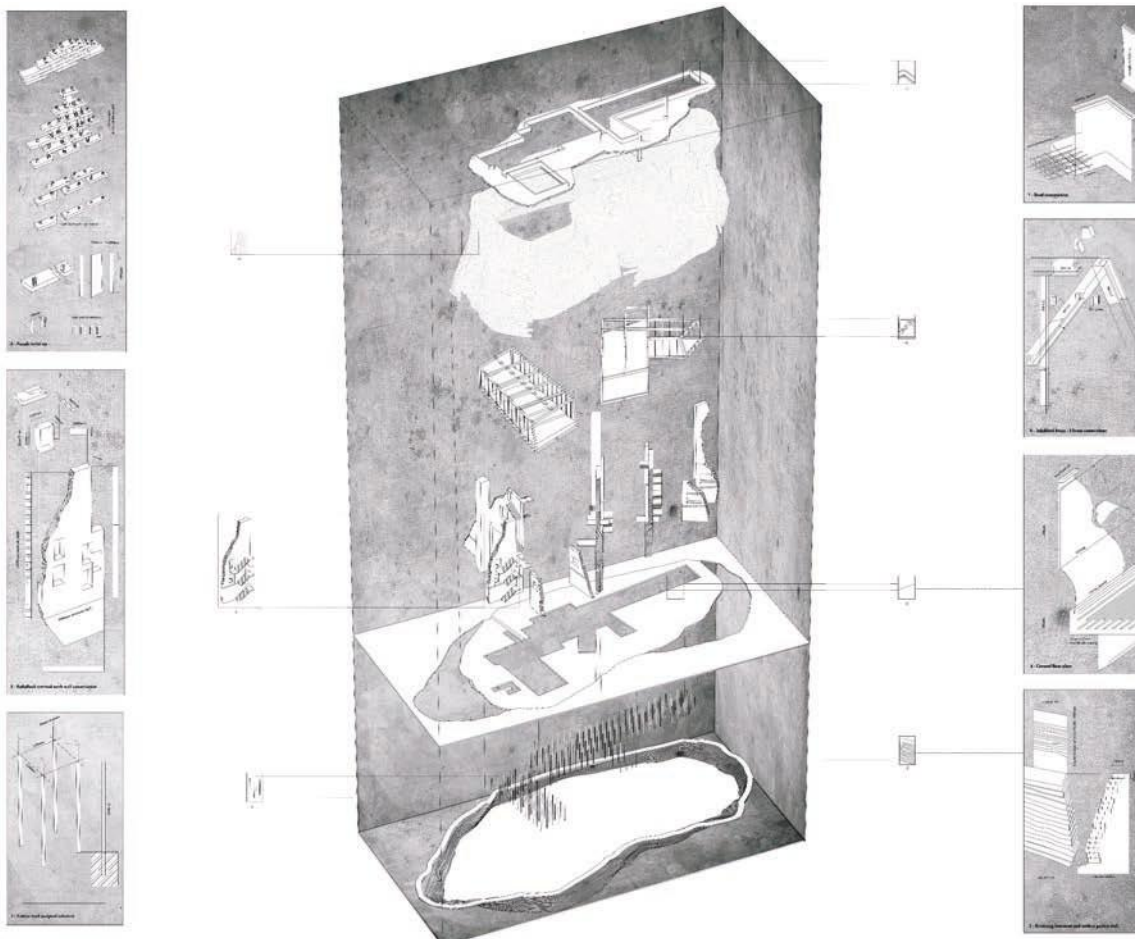
## Axonometric and isometric projections

Axonometric projection is one of the most frequently used drawing types for creating three-dimensional images in architecture. Isometric, dimetric and trimetric projections are types of axonometric drawings and together they form a group of drawing types called parallel projections or paraline drawings. These are three-dimensional drawings, projected using orthographic projections as generators, where all parallel lines in the object remain parallel in the drawing. Objects drawn in parallel projections do not appear to get smaller or larger as they recede, and line lengths remain dimensionally accurate.

Isometric drawings are formed when an object is turned so that all three axes meet the picture plane at the same angle, making the angles between the edges of the building or space 120 degrees. An isometric drawing can be drawn at any scale and so best illustrates the true projected size. In architectural drawings one axis is usually vertical and the other two are therefore at 30 degrees to the horizontal. Most architectural drawings are shown from the point of view of looking down (though details and ceilings may be best seen looking up) and view a plan that appears to be 'opened up' in the direction of viewing from 90 to 120 degrees. This is advantageous if the drawing reveals an interior, but otherwise

### Below

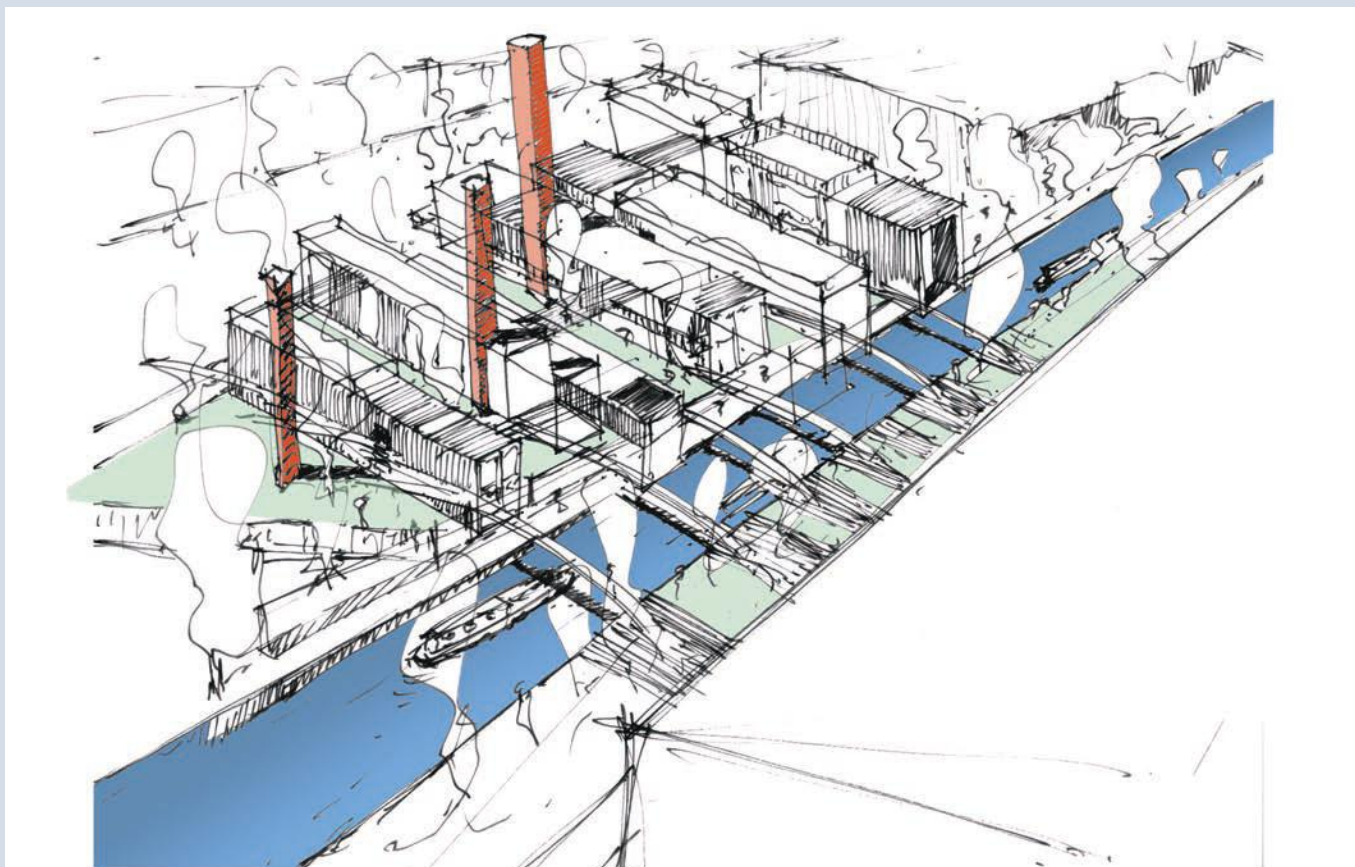
Geological intervention revealing the history of the site of The Mount, Princes Risborough, from Sophia Cole's project for a municipal archive (see pages 104 and 179). An exploded axonometric of the main structural elements is then broken down further to reveal more detail in construction techniques.





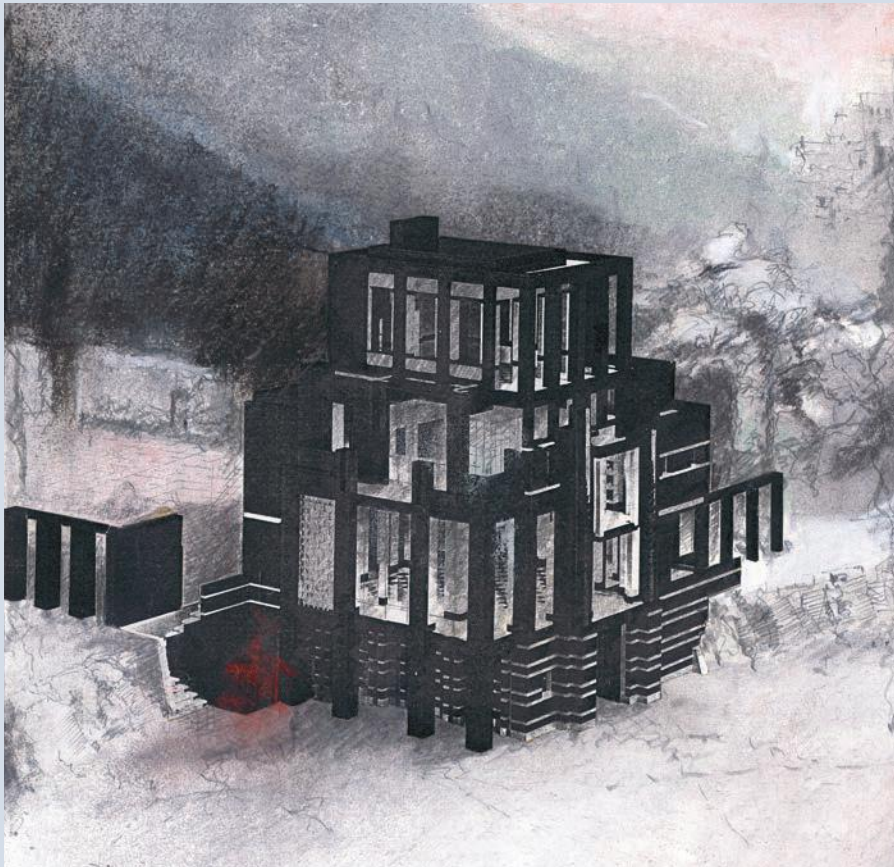


## Case Studies: Axonometric and isometric projections



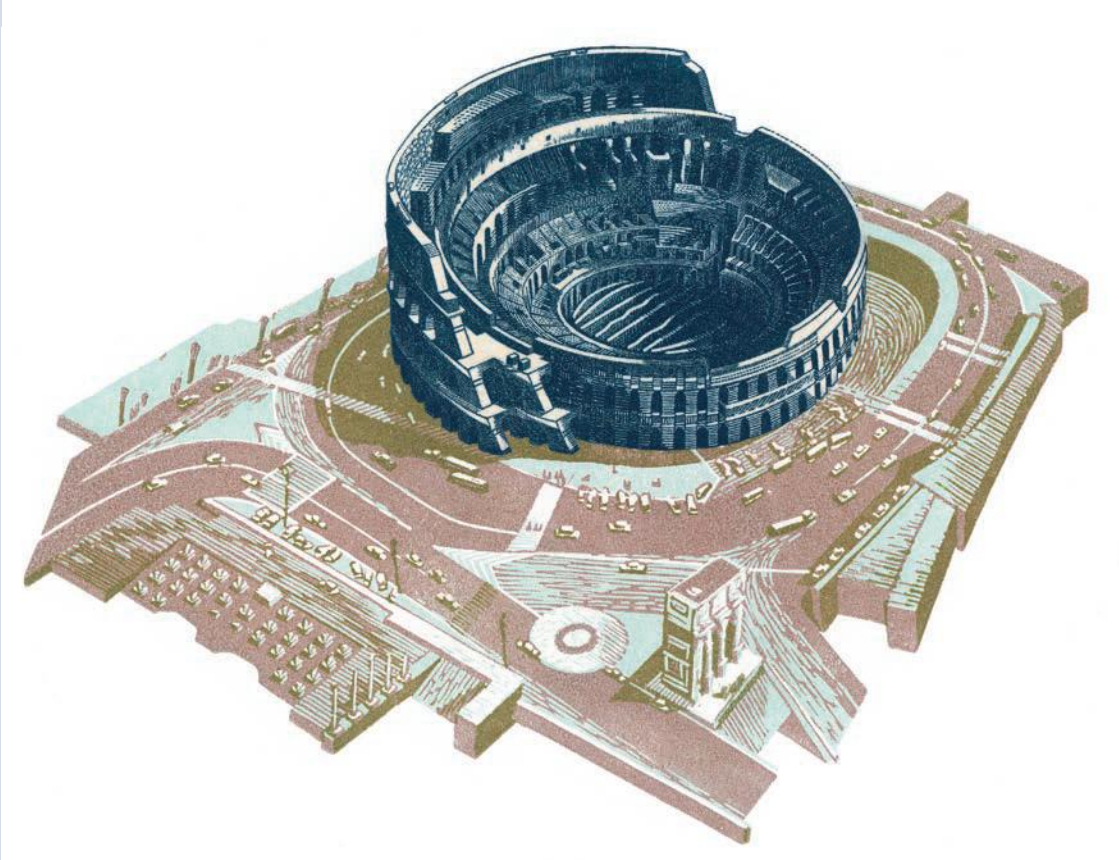
1

1. This sketch isometric study by Kyle Henderson illustrates how useful this kind of projection can be in representing an overall idea in its context. The pen sketch shows not only the form of the buildings, but sufficient detail to distinguish primary material differentiations. The context is mapped out in less detail, but the relationship between the building form and the series of bridges is clearly emphasized, with each bridge casting a well-defined shadow on the waterway below. The sketch is scanned, and areas filled in Photoshop represent a further layer to the narrative that is about the landscape, gardens and external spaces interspersed between buildings. The isometric sketch allows this building strategy to be represented as a whole and, because of the 'opening up' of the axis in this kind of projection, offers glimpses into the spaces between buildings.



2

2. By contrast, this well-known drawing of the Villa of the Physicist by Eric Parry is a more developed study using collage, pencil, inks and pastel. The basic form of this drawing is a simple isometric. Set against the black external masonry piers, the mysterious interior seems to draw its light from the landscape that is sketched in around it. The contrast in technique here is important, as the pastel and soft pencil easily fade into the distance and allow the building to appear as though integrated within it. In this drawing there is a wonderful balance between the constructed and the landscape, between light and dark and between elements that are well defined and others that are more open to interpretation.

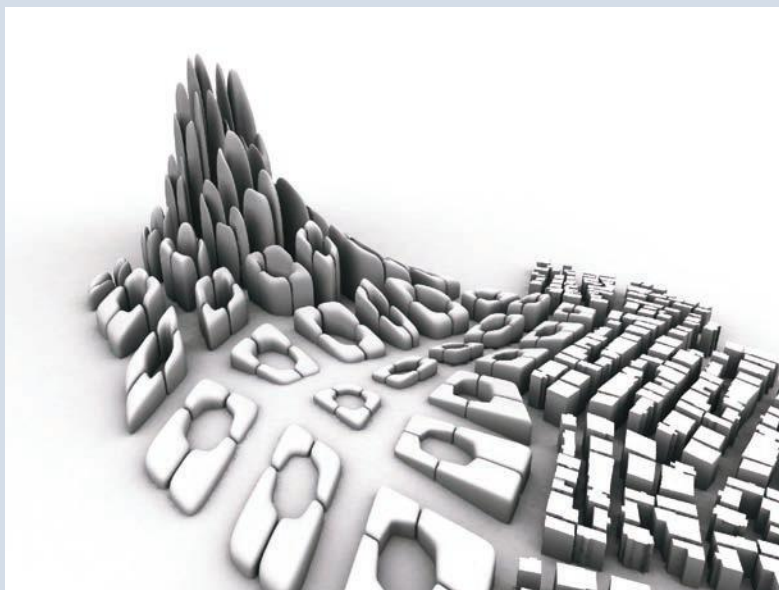
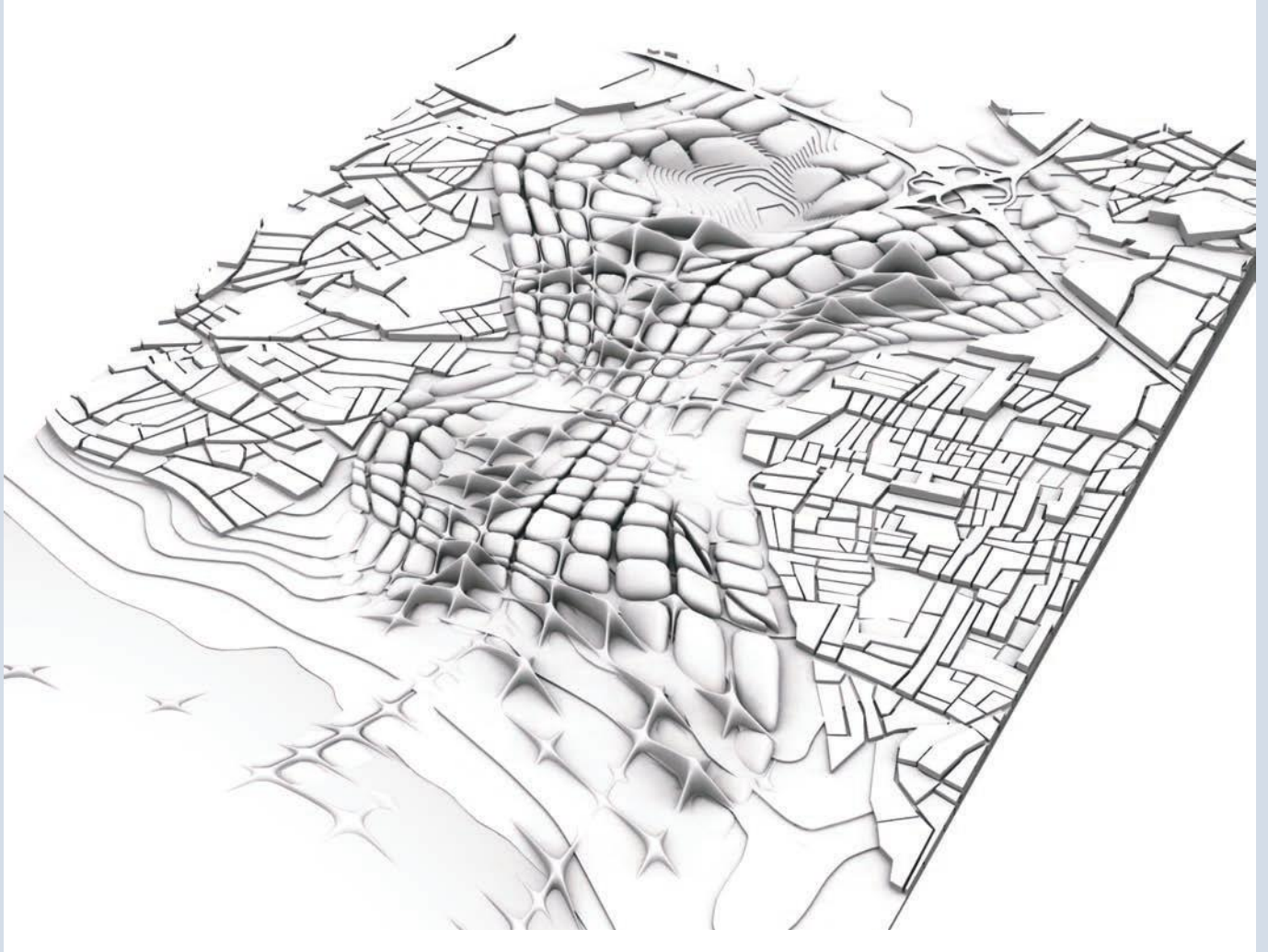


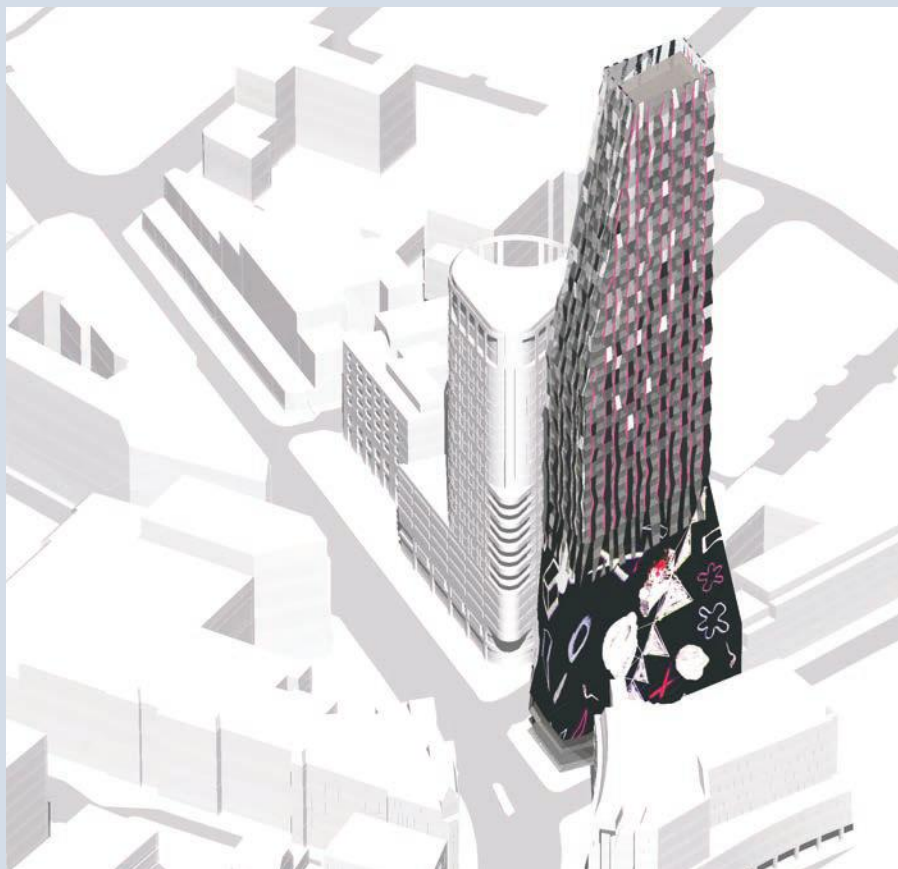
3

3. Inspired by an old postcard, *A Slice of Rome* by the artist Anne Desmet illustrates axonometric projection in an urban situation, in this case to show one of Rome's best-known landmarks in context. The image is made from a linocut and collaged wood-engraving on white paper. The road system surrounding the Colosseum is a three-colour reduction linocut print; the collaged Colosseum engraving superimposed on top is printed in blue/black ink onto cream Japanese Kozu-shi paper. The surrounding roads are bent, exaggerated or truncated to make a strong overall composition, but the image has a wonderful sense of movement that is born out of the detail within the image and the textures and colours of the print.

4. Zaha Hadid Architects, Kartal-Pendik masterplan, Istanbul. These drawings, vertical projections from a 'soft' grid in plan, illustrate the use of axonometrics to describe urban topography and building form at an urban scale. In the upper image note the simple technique of leaving the existing fabric in plan, projecting only the proposed development.



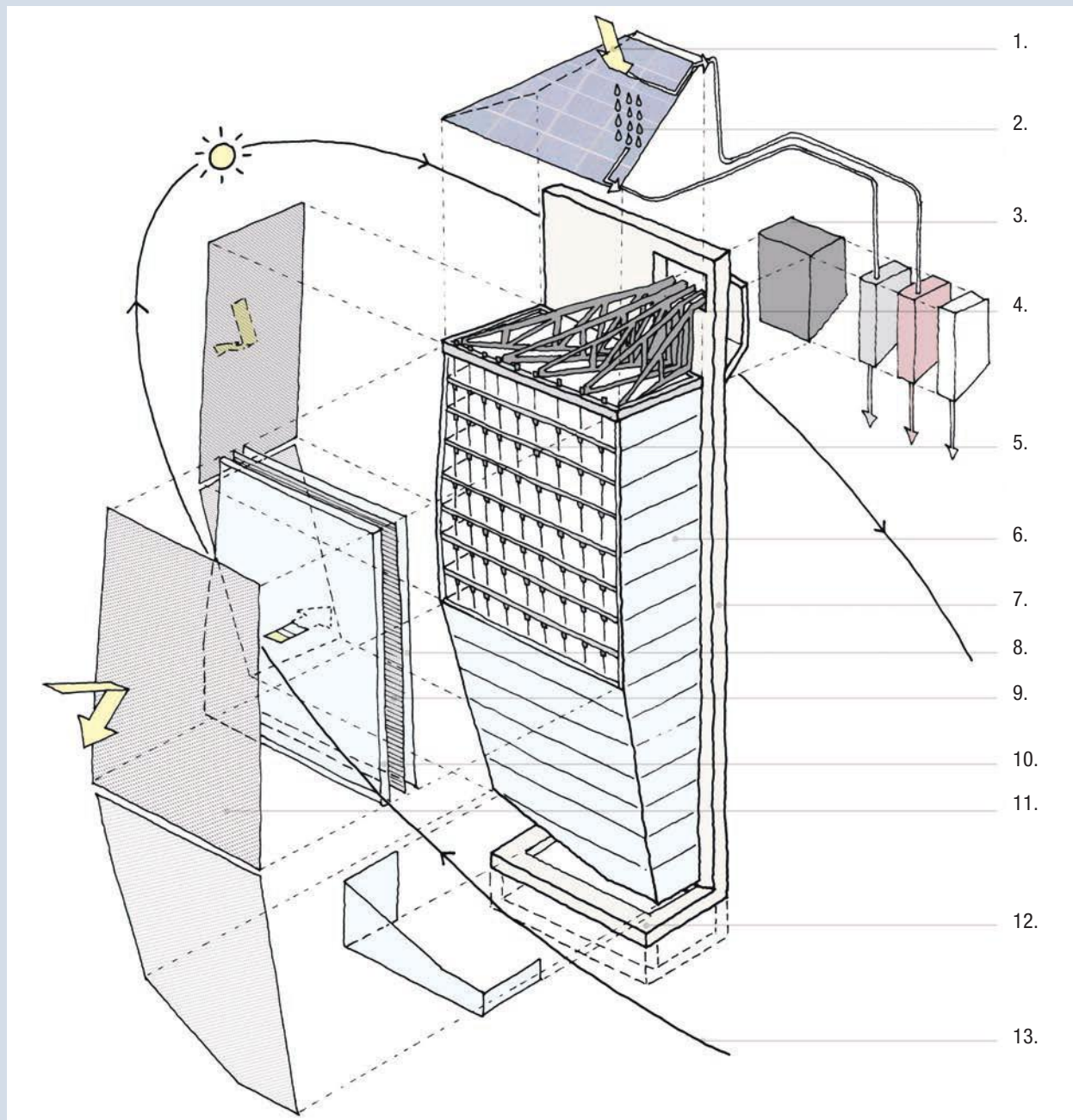




5

5. There are parallels between the visual character of the postcard-inspired image and this urban axonometric by Will Alsop. Alsop's axonometric is unequivocal in the way it draws attention to the focus building: the detail of the context is sufficient to describe the textures and scale of the city, but in a way that does not distract from the visual allure of the tower, with its distinctively inventive façade treatment.

6. Stephenson Bell's exploded axonometric shows their proposal for a building on Fountain Street in Manchester. The drawing is an exploded isometric drawing and was produced at presentation stage to convey the holistic design approach taken with the architectural design. The drawing is a pen-on-tracing paper sketch over a static shot of a virtual model that was produced in 3ds Max. The sketch was then scanned and additional information added in Photoshop to produce an image capable of clearly explaining all aspects of the architectural, structural and environmental principles at once. The image was then used in conjunction with renderings taken from the virtual model to form a cohesive presentation.



6

1. Solar energy heats owner's hot water
2. Grey water collected for toilet flushing, etc
3. Counterbalance
4. Steel truss supports uppermost floor plate
5. Lower floors suspended by perimeter cables tied back to uppermost floor (max 14 x 27 m (46 x 88½ ft) column-free floor plates)
6. No fritting to north-facing elevation
7. Limestone-clad core

8. Single-glazed inner 'skin'
9. Blinds within the cavity block low winter sun
10. Double-glazed outer 'skin'
11. Frit pattern on glass prevents excessive solar gain (frit pattern density varies by facet)
12. Column-free ground floor with double-height reception space
13. Sun path

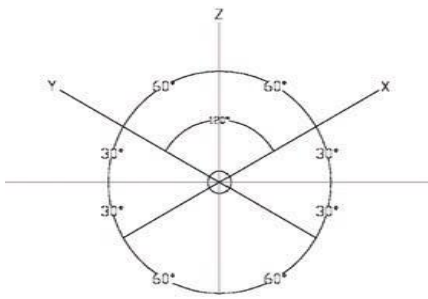
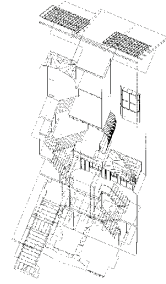


## STEP BY STEP USING SIMPLE CONVENTIONS

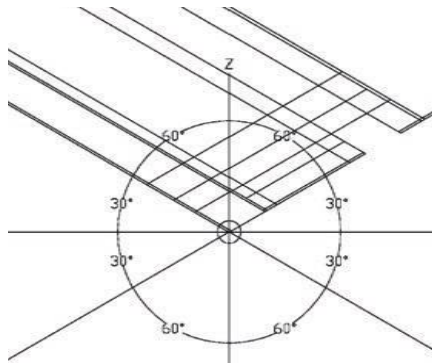
These examples by Chris Staniewski illustrate some of the simple conventions in drawing axonometric and isometric projections. Illustrated below and opposite are steps showing an isometric projection. The opposite page also shows examples of types of axonometric illustration.

### TIP CUTAWAYS

Use a cutaway axonometric to explore sequence and time in a project, and to explore otherwise hidden objects and features of your design.

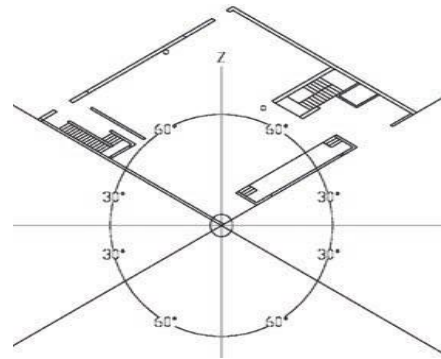


1. Establish the direction of the three principal axes X, Y and Z.

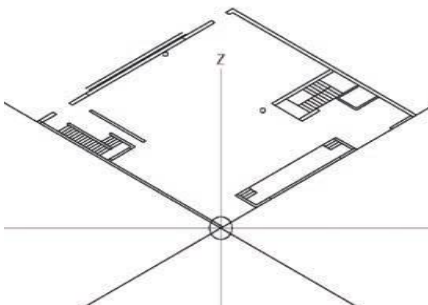


2. Using the plan, measure key points on the drawing and transfer these dimensions along the X and Y axes.

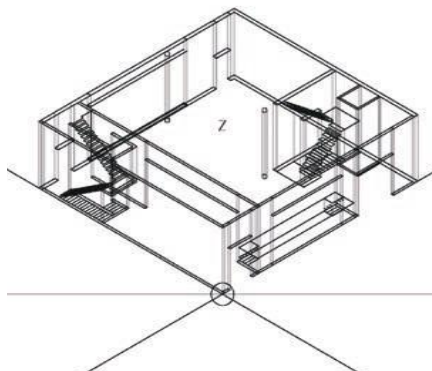
Every line that is drawn should run in parallel to one of the axes.



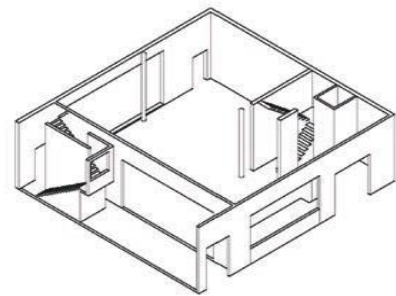
3. Using the basic principle of measuring the plan and transferring the measurements to the X and Y axes, the plan should start to emerge only at the angle defined by the three principal axes.



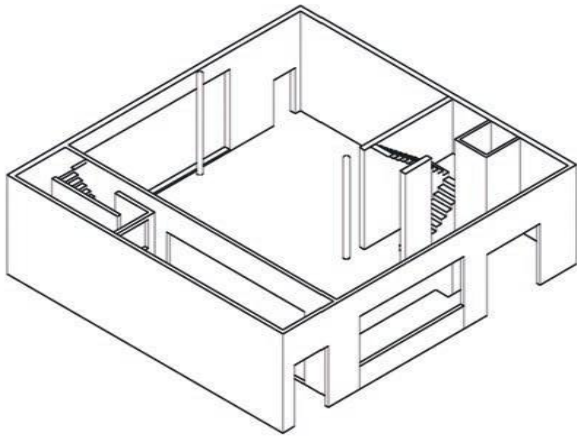
4. Once complete, and using another layer or sheet of tracing paper, begin assigning measurements along the Z axis, drawing lines vertically from each key point on the plan where walls and objects intersect.



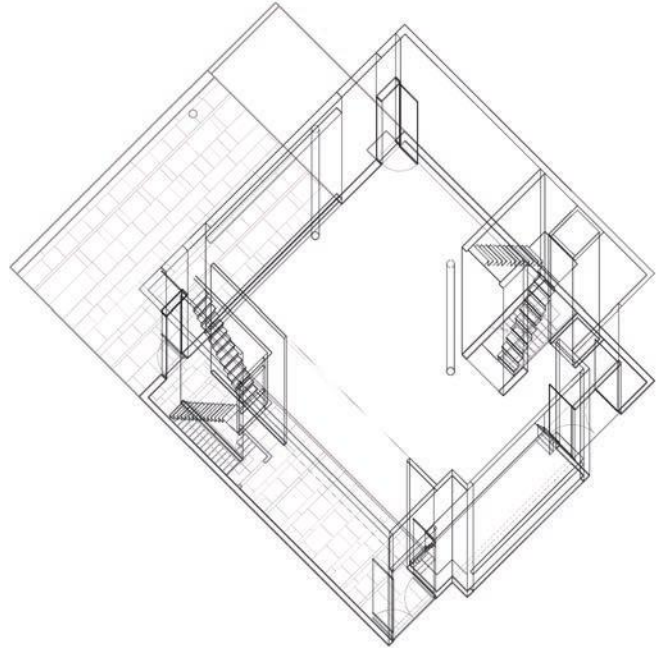
5. You will now be presented with a three-dimensional representation of the building, known as a wire-frame drawing. Once this stage is reached, the drawing can either be left as a wire-frame model or certain lines can be removed to make each wall solid, obstructing the view of architectural elements within the drawing.



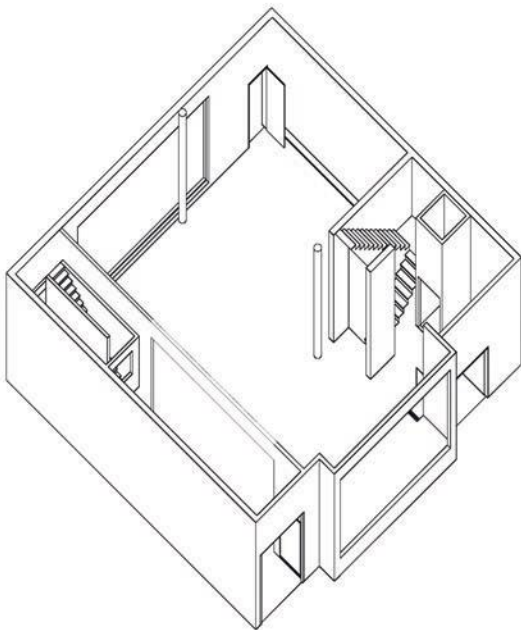
6. Final drawing with a key wall removed.



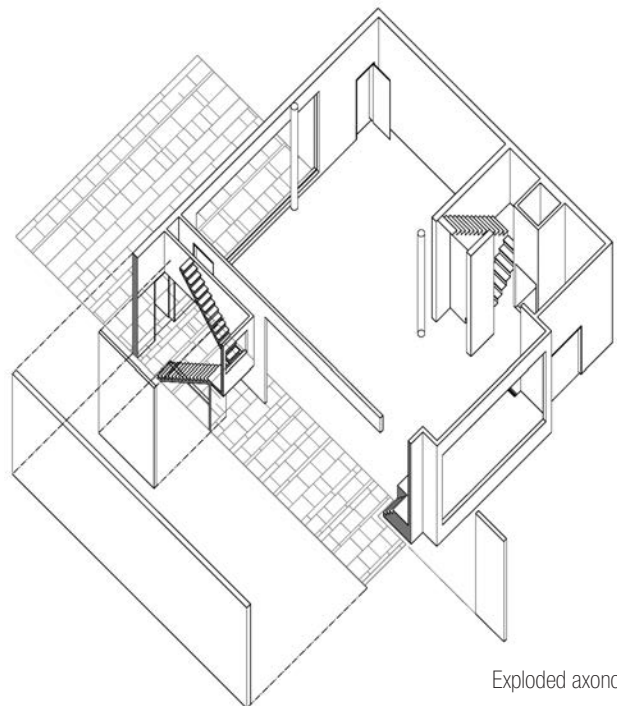
Isometric drawing



Wire-frame axonometric



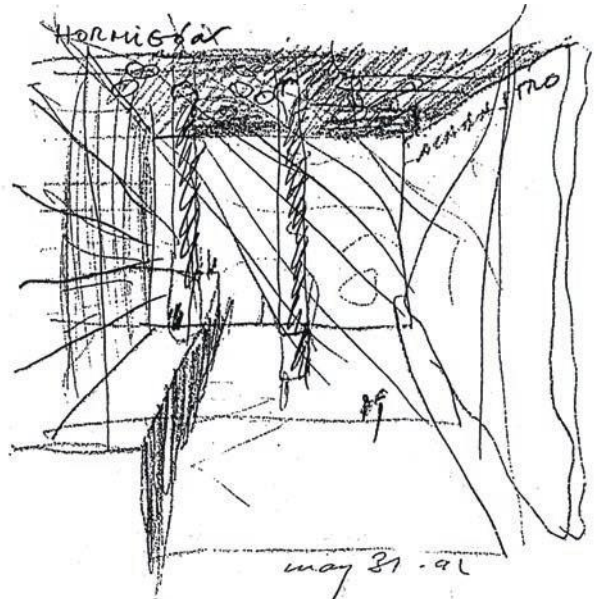
Solid axonometric



Exploded axonometric

## TIP EYE HEIGHTS

Think carefully about eye heights and how they are translated into horizon levels; this will affect what is visible in the image.



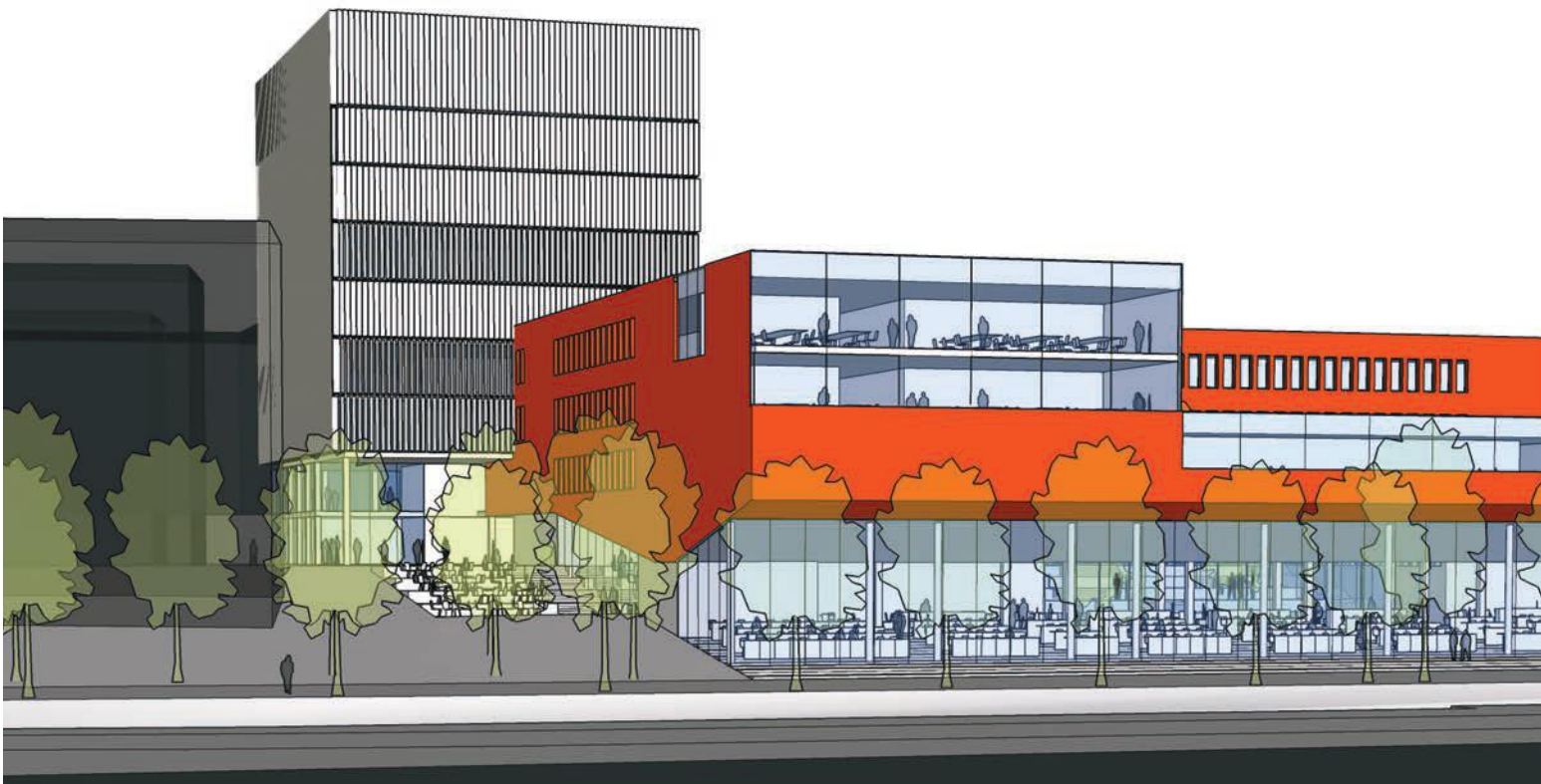
## Perspectives

The technique of perspective drawing is an ancient representational tool used to depict distance or spatial depth on a two-dimensional plane. There is a rich history of early perspectival drawing that eventually became subject to the consistent geometric, and subsequent mathematical, rules that we might recognize today. Perspective not only opened up new representational techniques, it was also a powerful way to see and to construct, fostering a new way of thinking and ordering space that became a powerful theme in later Western culture.

Today the persuasive power of perspectives persists: computer-generated perspective has become the single most powerful tool to communicate a project. Usurping the traditional artist's impression, the digital perspective shows, with unerring certainty, how the project relates to its context externally and what the spaces will be like internally. Often photorealistic, these modern perspectives now play a central role in architectural visualization.

There are two fundamental observations embodied in perspective. First, that objects appear smaller in the distance than they do close up. Second, that objects appear to become foreshortened along the line of sight.

The geometry of perspective drawing starts with the idea of a picture plane – an abstract plane that is held up to the object in view – and vanishing points, the points on





the horizon where parallel lines appear to converge. The number of vanishing points, which will depend on the viewing angle, will determine what kind of perspective is drawn. These are usually one-, two- or, more exceptionally, three-point linear perspectives.

A one-point perspective is perspective in its simplest form. It can be used when the main lines within the room or building are parallel or perpendicular to the line of sight, for example an interior view of a simple rectilinear room or a head-on view of an external façade.

A two-point perspective, on the other hand, is less static as an image and it allows a greater variety of viewpoints. It allows the viewer to be looking towards a corner of a room say, rather than remaining perpendicular to the main elements of the space. The room will now have two vanishing points (or potentially more) on the horizon, one for each set of parallel lines. When looking towards the corner of a room, the two walls would recede to respective vanishing points.

Finally a three-point perspective, which is more difficult to generate, is used to describe an additional vertical recession, as the building is seen from above or below.

Each of these perspectival grids can be constructed using basic computer modelling software. This facilitates what can be a painstaking process by hand, though at the same time it is also relatively quick to accurately sketch

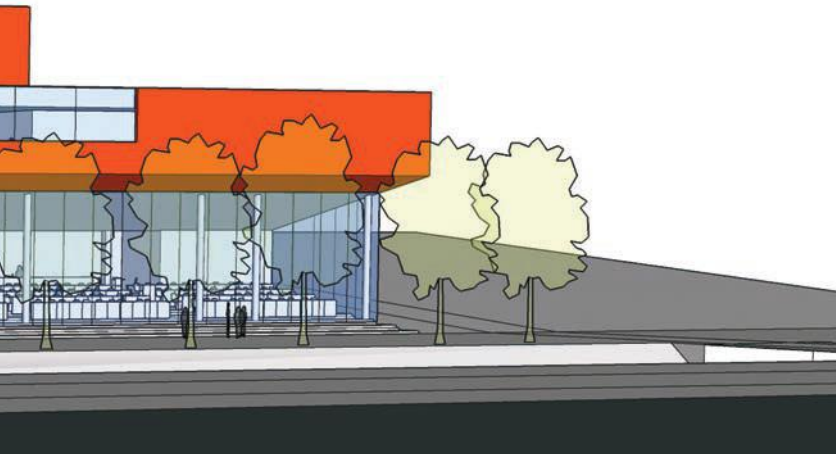
in perspective. Whatever method is used, it is important that perspectives are not presented as the only illustrations of a final proposal, but are shown together with other drawings, as drivers in the creative process of thinking about the building as a whole.

Independently, the final perspective illustration can act more as a marketing tool than a creative contribution to our understanding of the building. New ways of embedding the idea of three-dimensional representations of settings will combine diverse projections with models and film or animation to make up for the over-reliance on one singular geometric construct.

Perspective sketches test ideas. They swiftly reveal a sense of scale, structure and material. Sketching something three-dimensionally, regardless of how accurate the perspective is, opens up new ideas. Even at an early stage, the freely drawn perspective sketch drives the design process as it brings other drawings together; it is a vehicle for synthetic thinking of the project or space as a whole.

### TIP USING PERSPECTIVES

Always use perspectives in conjunction with other drawings during the design process. Use perspectives as much to think through as to illustrate a final proposal.



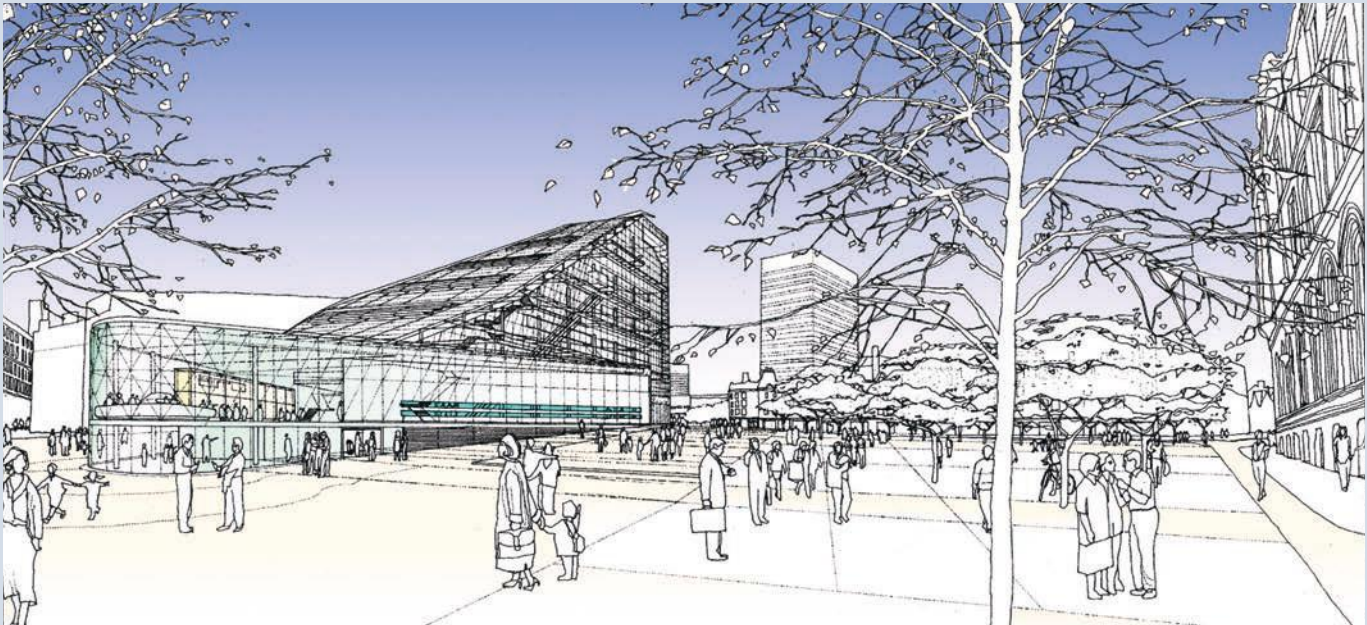
#### Opposite, top

Alberto Campo Baeza's perspective sketch for the Caja General de Ahorros, Granada, Spain, shows how perspectives can be used as a way to think through early design stages.

#### Left

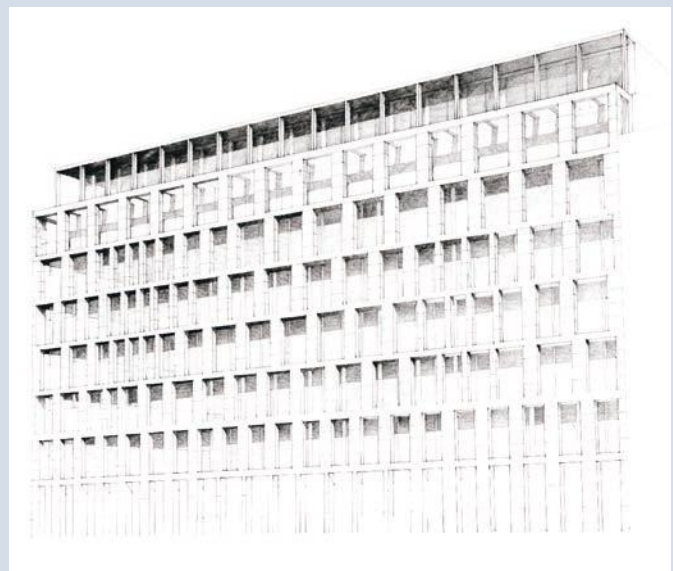
This view by Crepain Binst shows the context for their school in Artevelde, Ghent, Belgium. There is an appropriate restraint to the drawing, which is built up from a simple model and transparent layers of tone and shadow.

## Case Studies: Perspectives



1

1. A more developed, and particularly effective, hand-drawn perspective of Urbis Prow, Manchester, by Patrick Thomas of Ian Simpson Architects, had to convey building geometry accurately for purposes of a planning application. It was initially drawn by hand in ink on 112gsm A1 tracing paper using a Mars Magno 0.18mm nib pen. It was traced over a crude 'underlay', which involved splicing an early Form-Z model render showing the building's outer skin geometry only (i.e. no internal or cladding detail) together with a print of a digital photograph of existing conditions, taken from the same viewpoint. The final traced image was scanned in black and white, and coloured using Photoshop.



2



3a

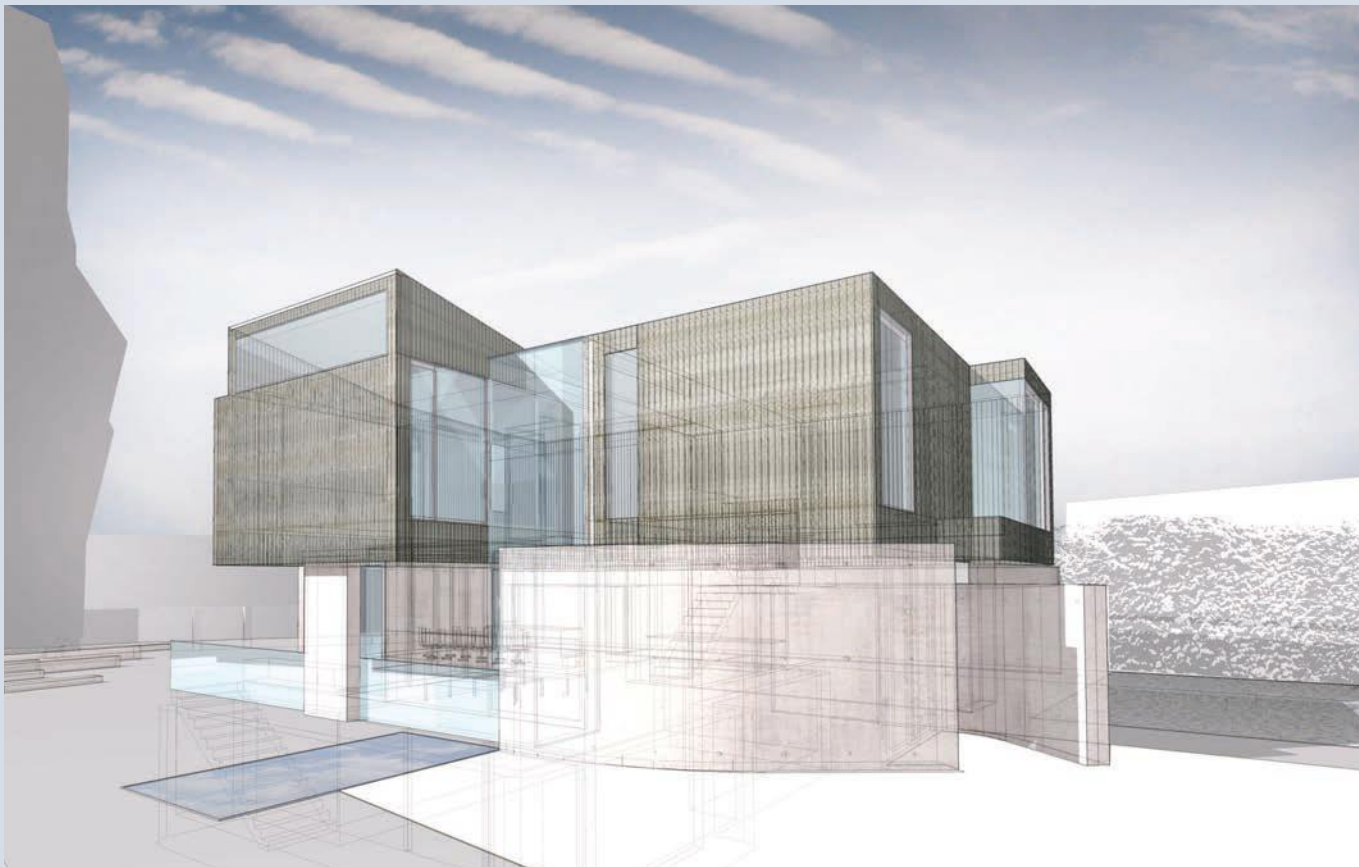
2. Eric Parry's pencil study of the façade of a building in Finsbury Square, London, is a wonderful piece of drafting, describing one of London's most contemporary additions in a medium that seems sympathetic to the quality of its masonry. The drawing, done on soft tissue, reads at one level as a study of light and stone. The perspective lines are subdued, creating only a loose framework for the sciagraphy. This reveals the depth of the façade, primary and second orders of piers, and the stanchions that moderate light conditions in the interior and which animate the body of the building.



3b

3a, b. These skilfully executed perspectives by Kyle Henderson demonstrate a presentation drawing based on a one-point perspective, first done by hand and then worked up in Photoshop.



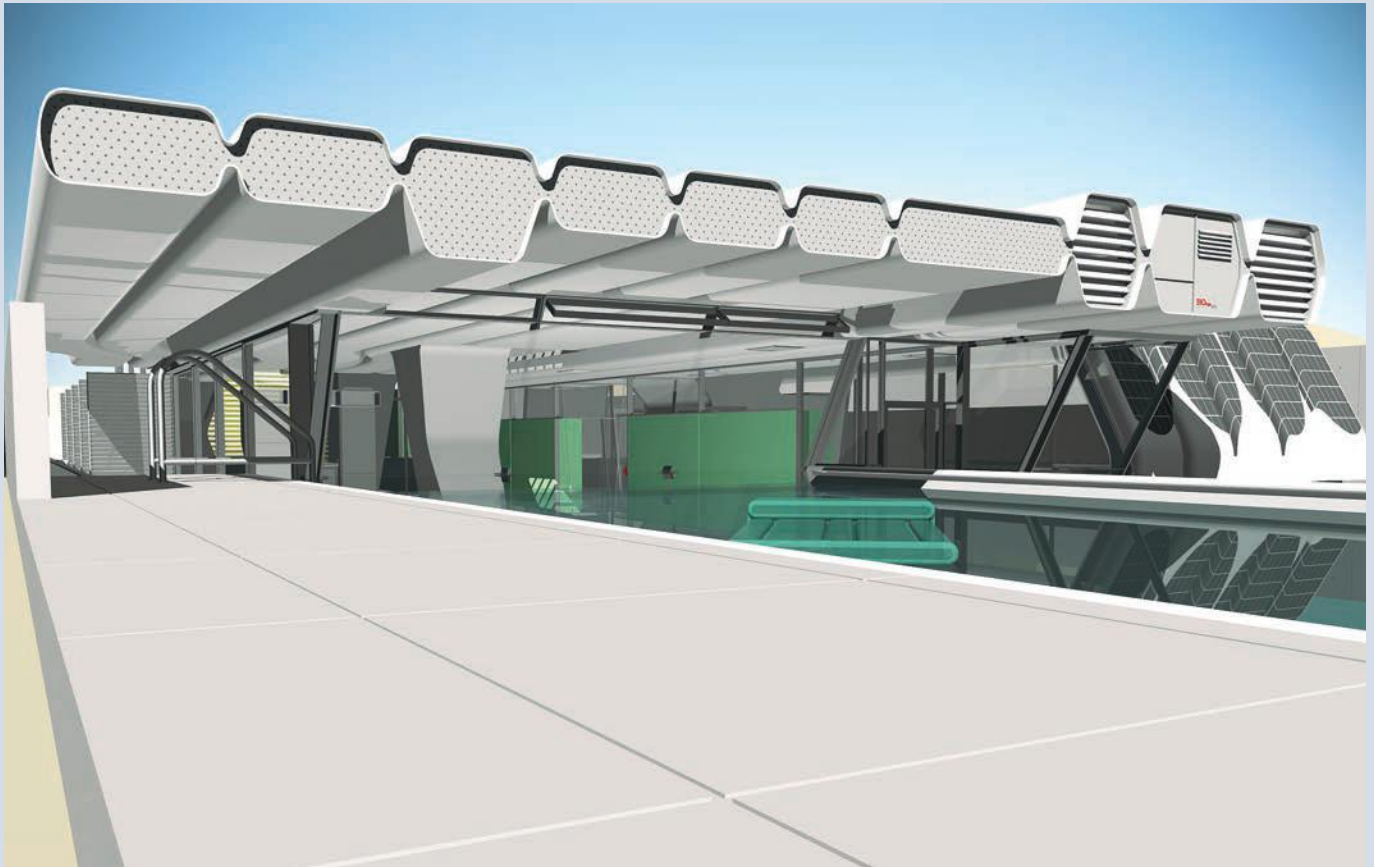


4

4. There is a similar delicacy to Meadowcroft Griffin's computer-generated perspective. Worked first as a wire-frame perspective in Microstation, the image is carefully built up as a series of delicate transparent layers to emphasize the interchange between the interior of the building, external gardens and wider context. This spatial ambiguity is balanced by precise shadows and key reflections that establish the body of the building and orientations.

#### TIP RENDERING

Only render what is important. Use render to draw attention to significant elements in the perspective drawing.



5a

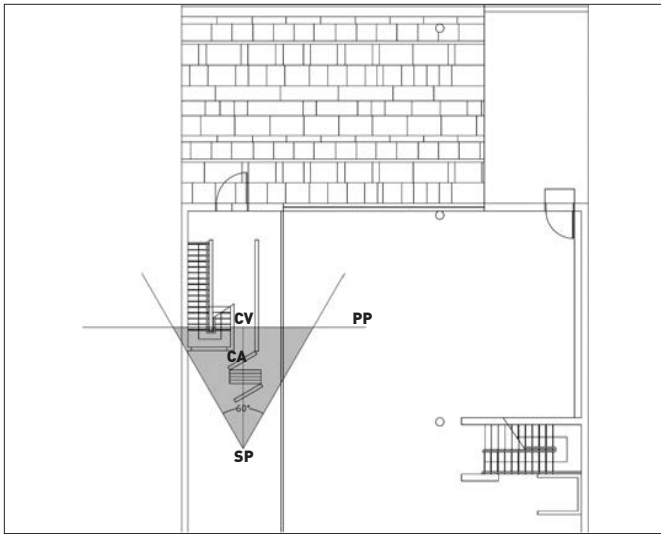
5a, b. Neil Denari's perspective renderings of the Corrugated Duct House (above) and Vertical Smooth House (right) are classic demonstrations of digital renderings of architectural design where perspective is set against well-balanced natural and artificial lighting.



5b

# STEP BY STEP DRAWING A ONE-POINT PERSPECTIVE

These examples by Chris Staniewski illustrate the way to create a one-point perspective starting with a plan.

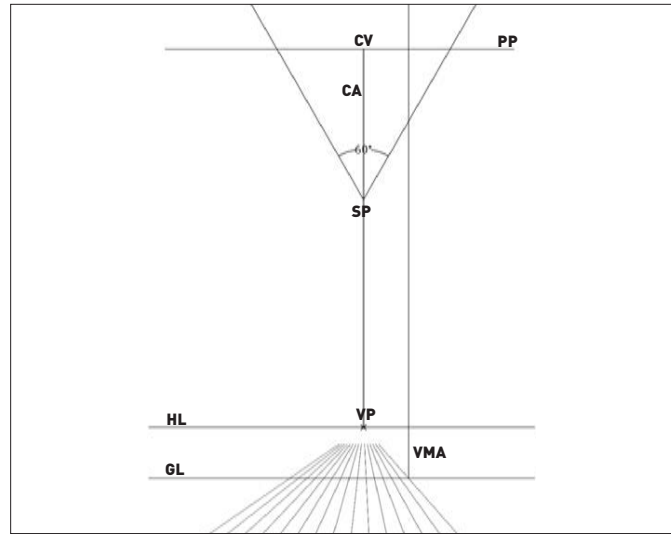


- 1 Start by looking at the plan. Imagine yourself in the building and think about what you would like to see. Think about the most interesting features that would describe your design to others. What would you see and what would be hidden from view?

The field of view for this drawing is highlighted in grey; note what you will see and where walls will restrict your view. These will need to be made evident in the perspective drawing, as they are a product of the design.

Establish the station point (SP). Simply put, this is where you would be standing observing the perspective you are about to draw. Everything you want to describe should fit within a 60-degree field of vision; if it does not, move the SP back or further away from what you want to draw.

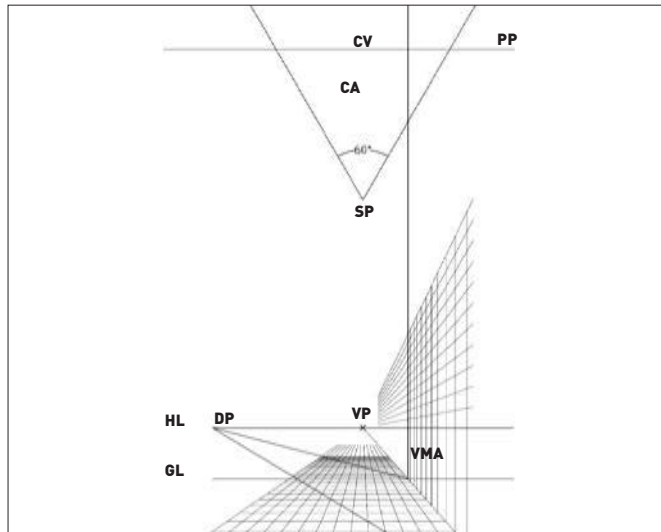
Draw a vertical line for the central axis (CA) from the station point and establish a centre of vision (CV) along that line followed by a picture plane intersecting this point. This locates the distant points and objects we will draw in the perspective. Extend two lines at 30 degrees from the CA between the SP and the picture plane (PP). Using the plan set-up as a guide, re-draw the PP as the horizon line (HL), while the CV will become the vanishing point (VP) for the perspective drawing.



- 2 The ground line (GL) and the vertical measuring axis (VMA) should be drawn an equal distance from both the HL and the CA parallel with each and perpendicular to each other. Along the GL draw equal points of measurement – you may wish to use small increments of measurement on a detailed drawing or larger increments on a less detailed drawing. Since this drawing is relatively simple, the increments are relatively large. Put the same equal measurements on the VMA. These measurements can be extended towards the vanishing point and taken below the ground line. This will give the effect of receding into the distance – the goal of drawing an accurate perspective.

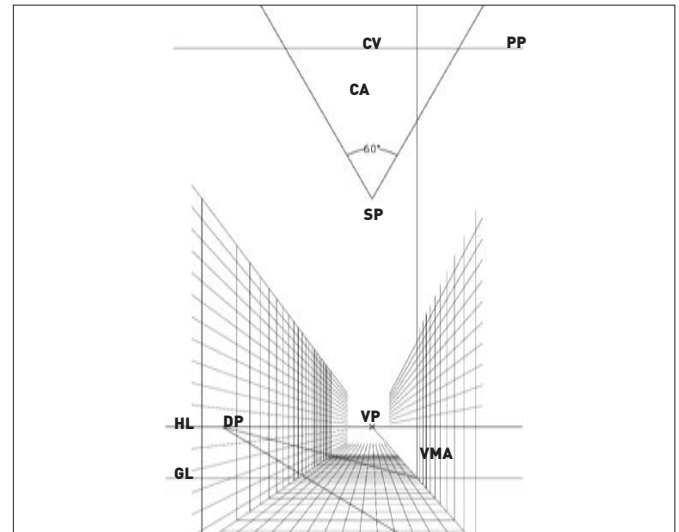
Measurements should also be added to the CA before proceeding onto the next step.



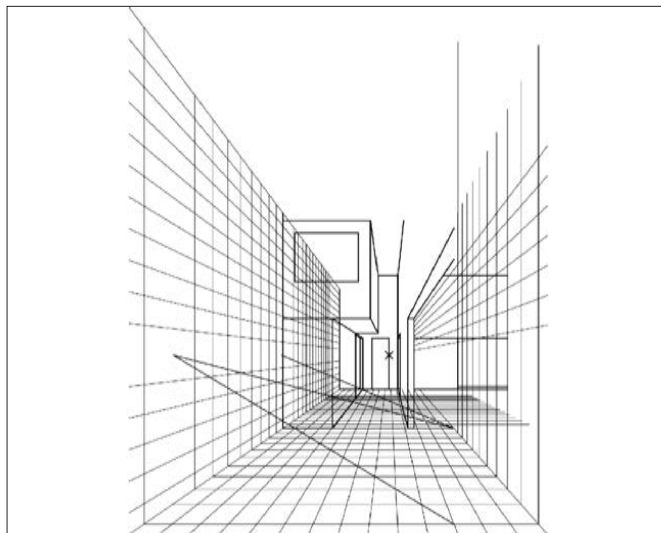


- 3** In order to complete the perspective grid you need to establish a series of horizontal lines. However, like the vertical lines, they too will be subject to the vanishing point in a single-point perspective drawing.

Drawing two 45-degree lines from the SP will intersect the HL and give you a diagonal point (DP). Where these lines cross the grid lines are points at which horizontal lines can be drawn, parallel to the GL. This allows you to complete the grid below the GL. To complete the grid above the GL, draw a line between the intersection of the GL and the VMA and a point halfway between the DP and the VP.



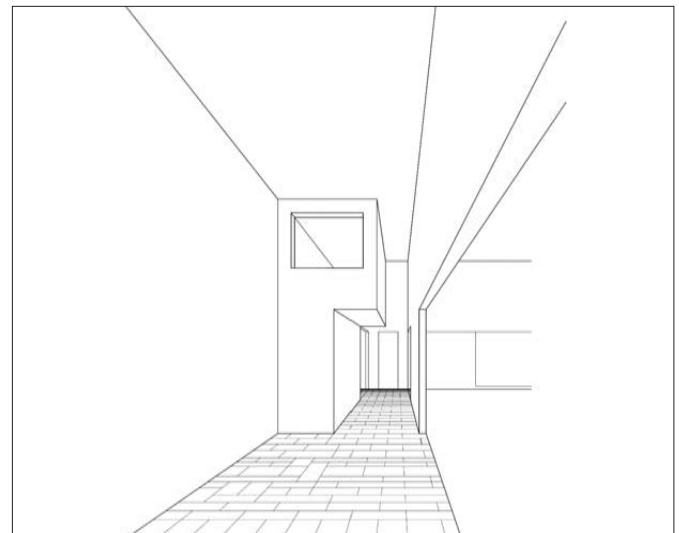
- 4** At the edge of the grid you have just created you can draw vertical lines and, using the same principles, create a series of grids that define the walls and ceiling. Measurements can be taken from the plans and sections and applied to the perspective grid to ensure accuracy.



- 5** This grid defines points in space and allows you to plot points in three-dimensional space quickly and accurately, allowing you to create precise representations of your spaces at a human scale. The perspective grid can be used again for creating other internal and external perspectives of a similar size and scale for your building.

Much like the isometric drawing (see page 130), you can take measurements from the plan and transfer them to the perspective grid to create the footprint of a chosen object.

The height of objects is determined by measuring off the CA. All non-vertical lines should be seen to converge upon the vanishing points to give the illusion of perspective.



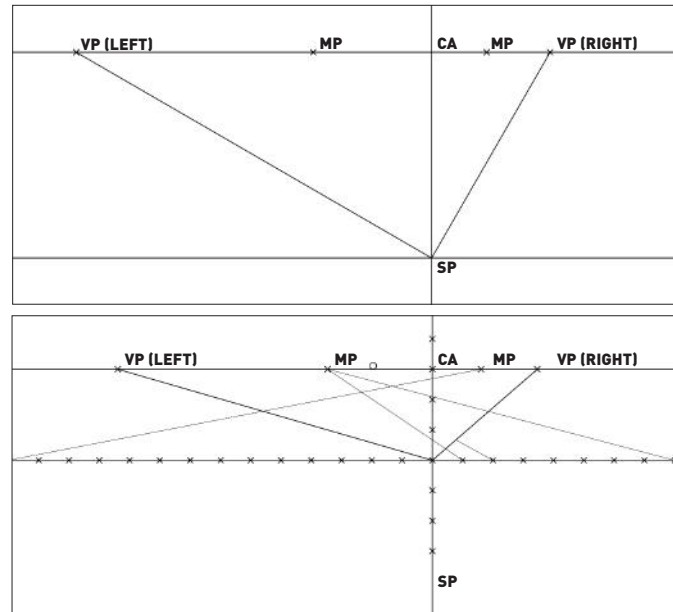
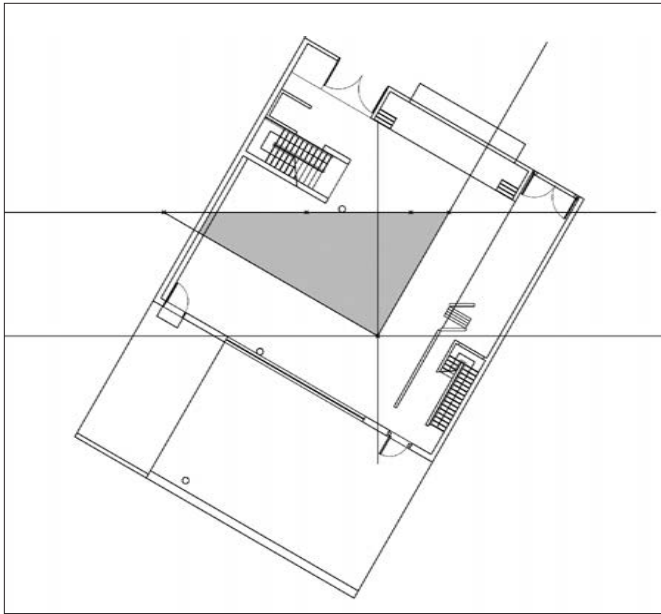
- 6** People and familiar objects appropriate to the building can be added to the final perspective view in order to give the drawing a sense of scale.

# STEP BY STEP DRAWING A TWO-POINT PERSPECTIVE

Here, a two-point perspective is drawn using measuring points on a two-point perspective grid.

Start by looking at the plan. Imagine yourself in the building and think about what you would like to see. Think about the most interesting features that would describe your design to

others; what you would see and what would be hidden from view. The field of view for this drawing is highlighted in grey; you will see the staircase, a column, the wall to the left and the wall to the right.



- 1 Having chosen an interesting view or perspective, draw a plan or a simple representation of the building at an appropriate scale. This should be oriented so that the vertical lines within the field of view can simply be projected downwards from the grid you are about to create. (The reason for this will become more evident later.)

The first and most important point to establish is the station point (SP). Having imagined what you want to see when standing in your building, this point represents where you will be. Most of what you want to describe in the drawing will fall within a 60-degree field of view.

Draw a vertical line from the SP up the page; this is the central axis (CA), followed by the line of the picture plane (PP) perpendicular to this axis. It is useful for the PP to intersect a vertical element in the space so that vertical measurements can be easily established and the perspective can be drawn with an accurate representation of height.

Next it's time to establish the vanishing points (VPs). Draw lines between the SP and the PP. It is important that these lines are parallel with the plan. Where these lines intersect the PP, establish the left and right VP.

- 2 Top image. These few points are the key to establishing a perspective grid, which you will use to draw your perspective. The diagram can now be moved vertically down the page so that you can see it more clearly.

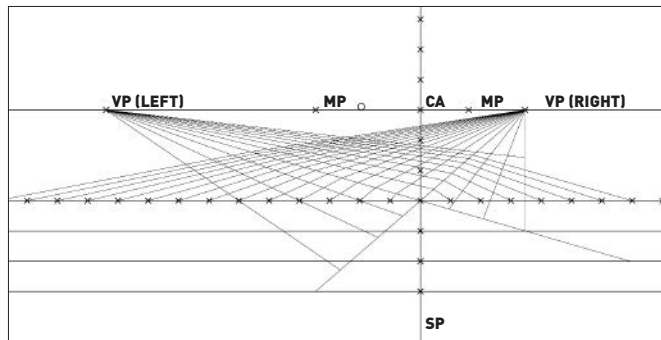
Placing a compass on each VP, draw an arc between the SP and the PP, creating measuring points (MPs) – one to the left and one to the right of the CA. These points are important, as they will establish the grid you will need to construct the perspective.

Now it is time to construct the perspective grid.

- 3 Bottom image. Establish the horizon line (HL), which represents your eye level in the drawing followed by the ground line (GL). The GL is nothing more than a line upon which measurements are laid out but it must intersect the SP.

Transfer the MPs and the VPs to the new HL.

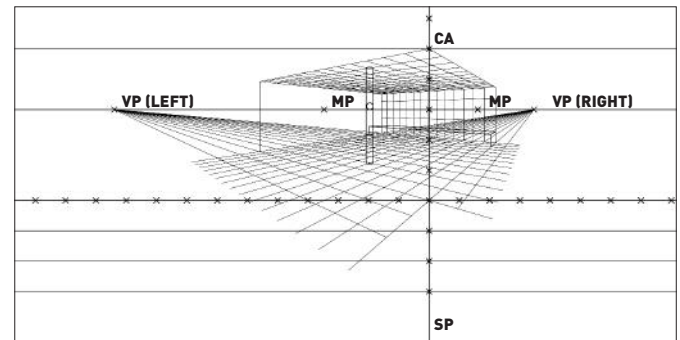
Along the GL draw equal points of measurement; you may wish to use small increments of measurement on a detailed drawing or larger increments on a less detailed drawing. This drawing is relatively simple so the increments are quite large. Put the same equal measurements on the CA.



- 4 Between each point of measurement on the GL and the measuring point on the opposite side of the vertical axis draw lines to the line between the VPs and the SP. Repeat this process on the opposite side.

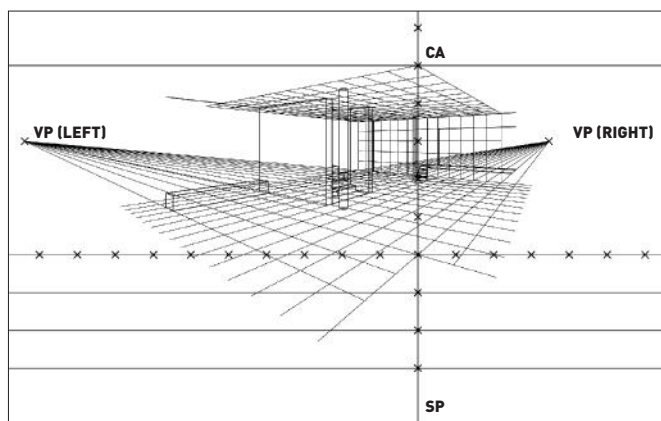
You should see a new set of measuring points on the lines that establish the field of vision. Draw lines between these new points and the VPs to create the perspective grid.

If necessary these points can be further subdivided to create a more detailed grid.



- 5 The process can be repeated to produce an overhead grid at the required ceiling height and to the sides to create a measuring grid along a wall.

This grid defines points in space and allows you to plot points in three-dimensional space quickly and accurately, enabling you to create accurate representations of your spaces at a human scale.

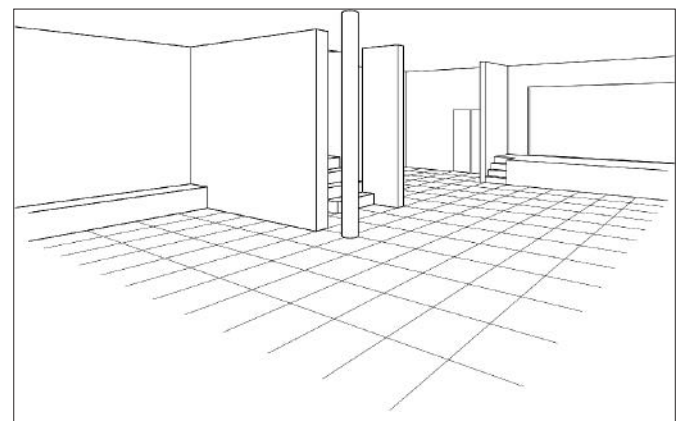


- 6 The perspective grid can be used again for creating other internal and external perspectives of a similar size and scale for your building.

As in the isometric drawing (see page 130), you can take measurements from the plan and transfer them to the perspective grid to create the footprint of a chosen object.

The height of objects is determined by measuring off the CA.

All non-vertical lines should be seen to converge upon the vanishing points to give the illusion of perspective.

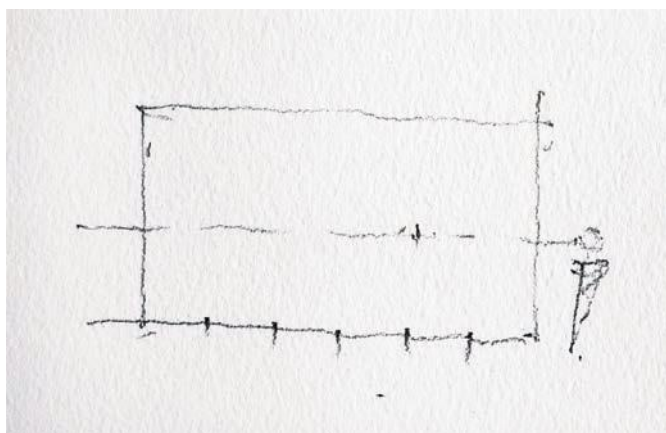


- 7 Add people/familiar objects appropriate to the building to give a sense of scale.

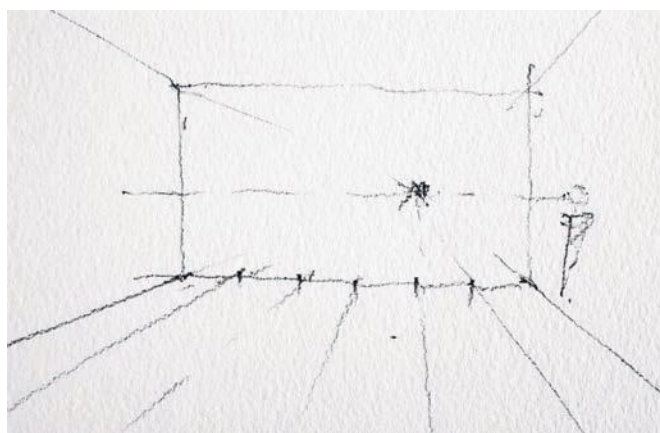


## STEP BY STEP MAKING RAPID PERSPECTIVE SKETCHES BY HAND

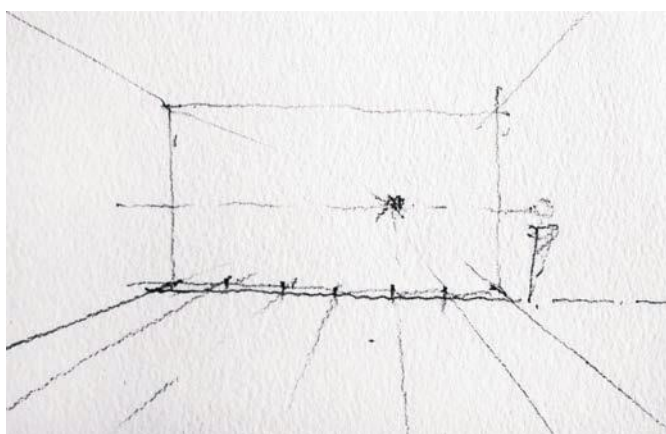
The illustrations here show a method of rapidly making one-point perspective sketches.



- 1 Start with an elevation — either internal or external. This should be sketched in proportion so that running dimensions can be estimated (usually) along the lower edge.



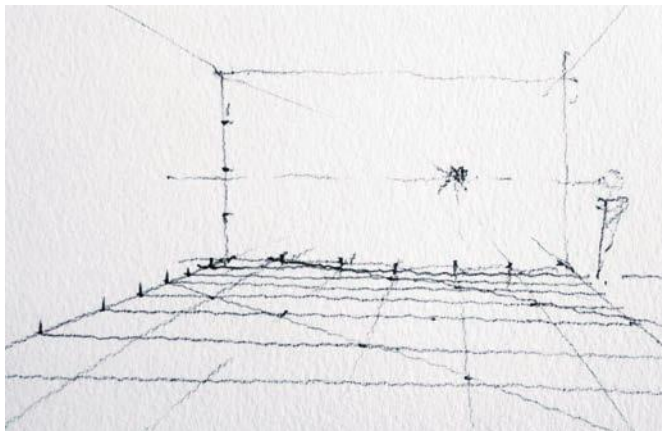
- 2 Estimate the eye level. Standard heights are 1.5 m (4 ft 11 in) for standing and 1.35 m (4 ft 5 in) for sitting. Scale off the elevation to draw a horizon line (HL) at the chosen eye height.



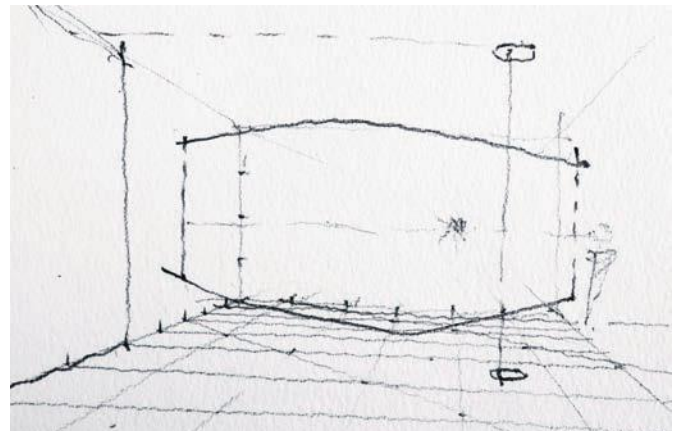
- 3 Locate the vanishing point (VP) on the HL. If necessary a set of vertical scales can be marked off along edges of the elevation. Project from the VP to establish perspectival lines.



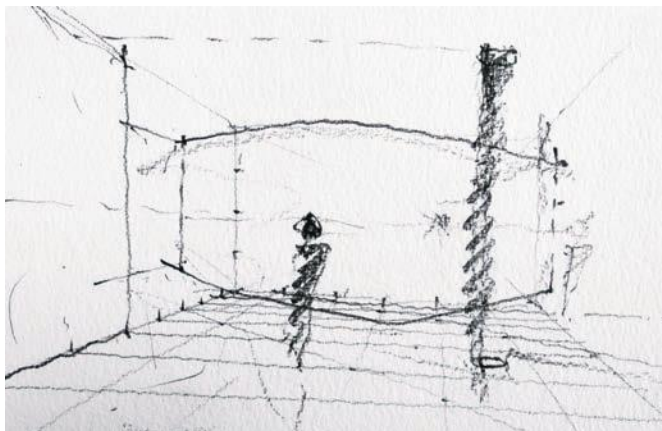
- 4 The next stage of the drawing is to establish perspectival recession. This is done using the idea that a 45-degree diagonal running across the drawing will locate all the 'squares' in the drawing. This diagonal can be quickly located by eye, as shown: locate a horizontal line just below the lower edge of the elevation. This is an estimate of the extent of the square closest to the elevation.



**5** A diagonal can then be drawn across the squares to establish all others in plan.



**6** Don't overwork the drawing by hand. This kind of sketch can only establish the overall proportions.



**7** A perspective sketch can be quickly taken back into Photoshop to add layers of tone or texture, figures and key lines to aid definition.



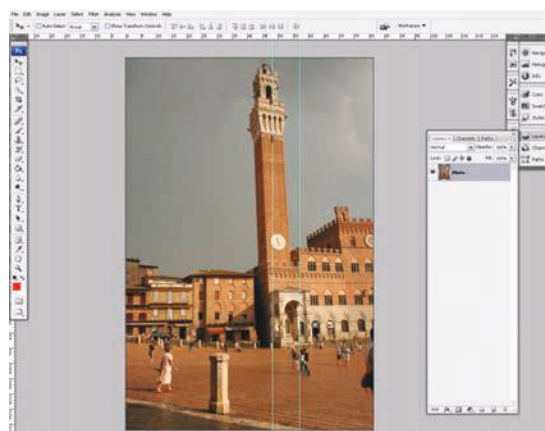
**8** The final artwork.

# STEP BY STEP CORRECTING PERSPECTIVE DISTORTION

The sequence illustrated here (by Ian Henderson) was created in Photoshop, but this work could also be done in several other similar software packages and applications.



- 1 Original photograph. Owing to the wide-angle lens used when taking this photograph the buildings appear to be leaning back and converging towards their roofs.

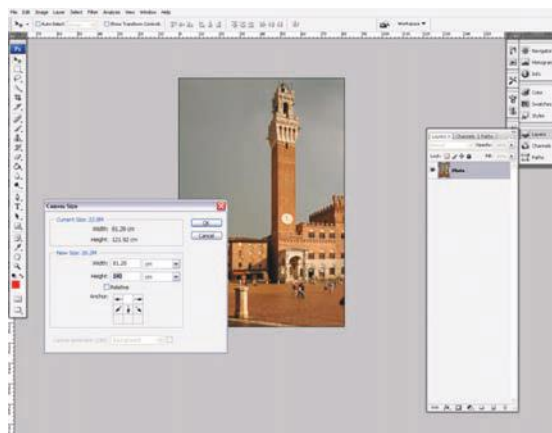


- 2 Set up guidelines. To correct the perspective in the photograph, first set up some key guidelines or turn on the user grid. To create a guideline, make sure the rules are turned on. Using the Move tool, drag a guideline from a rule and position it.

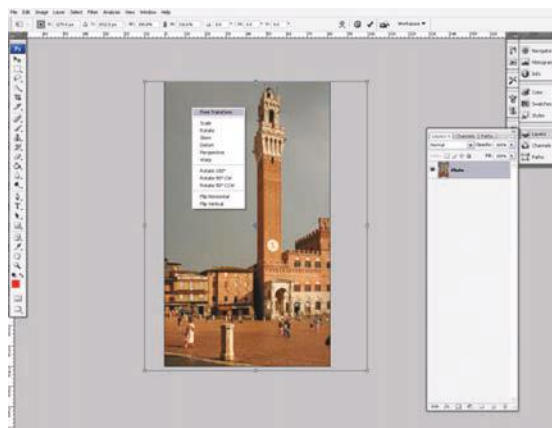


- 3 Transform image using Distort. To enable you to adjust the image it needs to be unlocked from the background. Double-left-click on the Background layer to convert it into a standard usable layer, and rename it. Ctrl-T to activate the Transform tool. Right-click over the photograph to access the Transform functions. Select Distort and adjust the anchor points until the perspective has been corrected. Double-click or hit Return to apply changes.





- 4 Adjust canvas size. As a result of the transformation, the people in the lower half of the photograph appear to be squashed. Activate Adjust Canvas Size and increase the canvas size to the bottom of the photograph, allowing enough space to correct the proportion of the people.



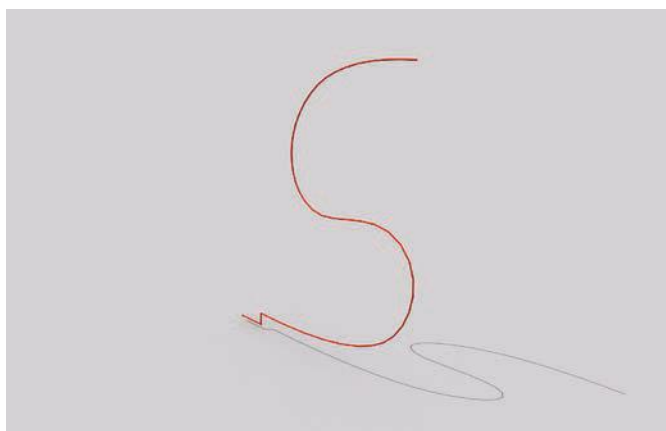
- 5 Transform image using Free Transform. Ctrl-T to activate the Free Transform tool. Select the lower mid-anchor point and stretch downwards until the people in the photograph appear in correct proportion. Crop any leftover canvas using the Crop tool.



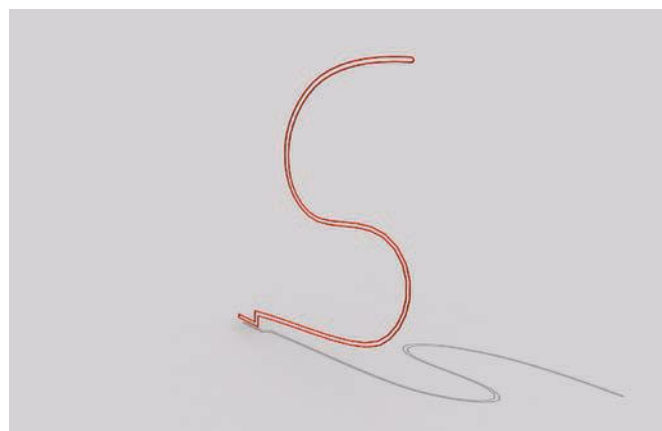
- 6 Final image. The buildings in the final photograph now have perfectly vertical lines.

## STEP BY STEP CREATING A LATHE MODEL

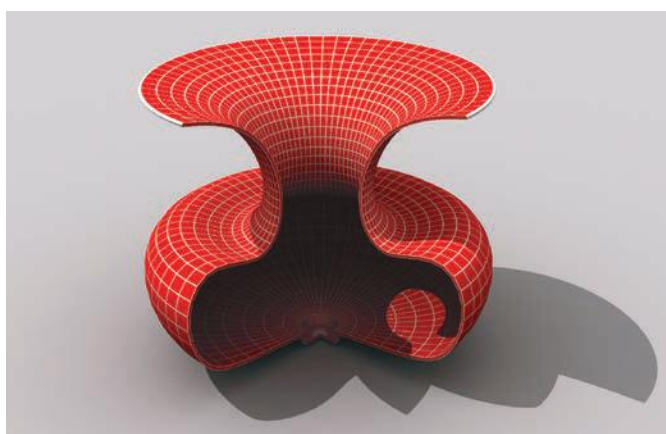
The following model sequences (by Ian Henderson) can be created using most generic computer graphics programs, such as 3ds Max, Maya, Softimage or LightWave.



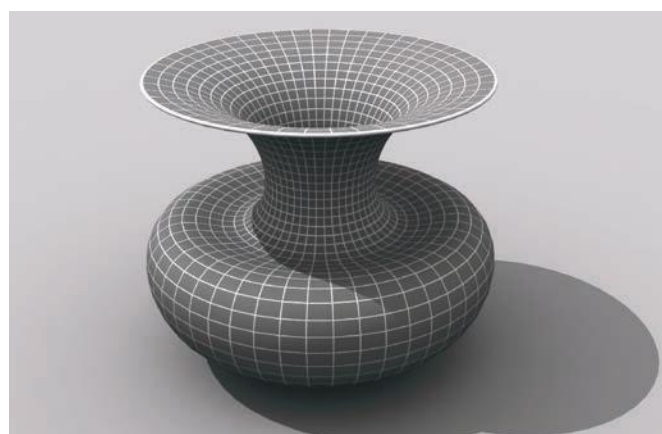
**1** Spline. Create the required shape using the Line tool.



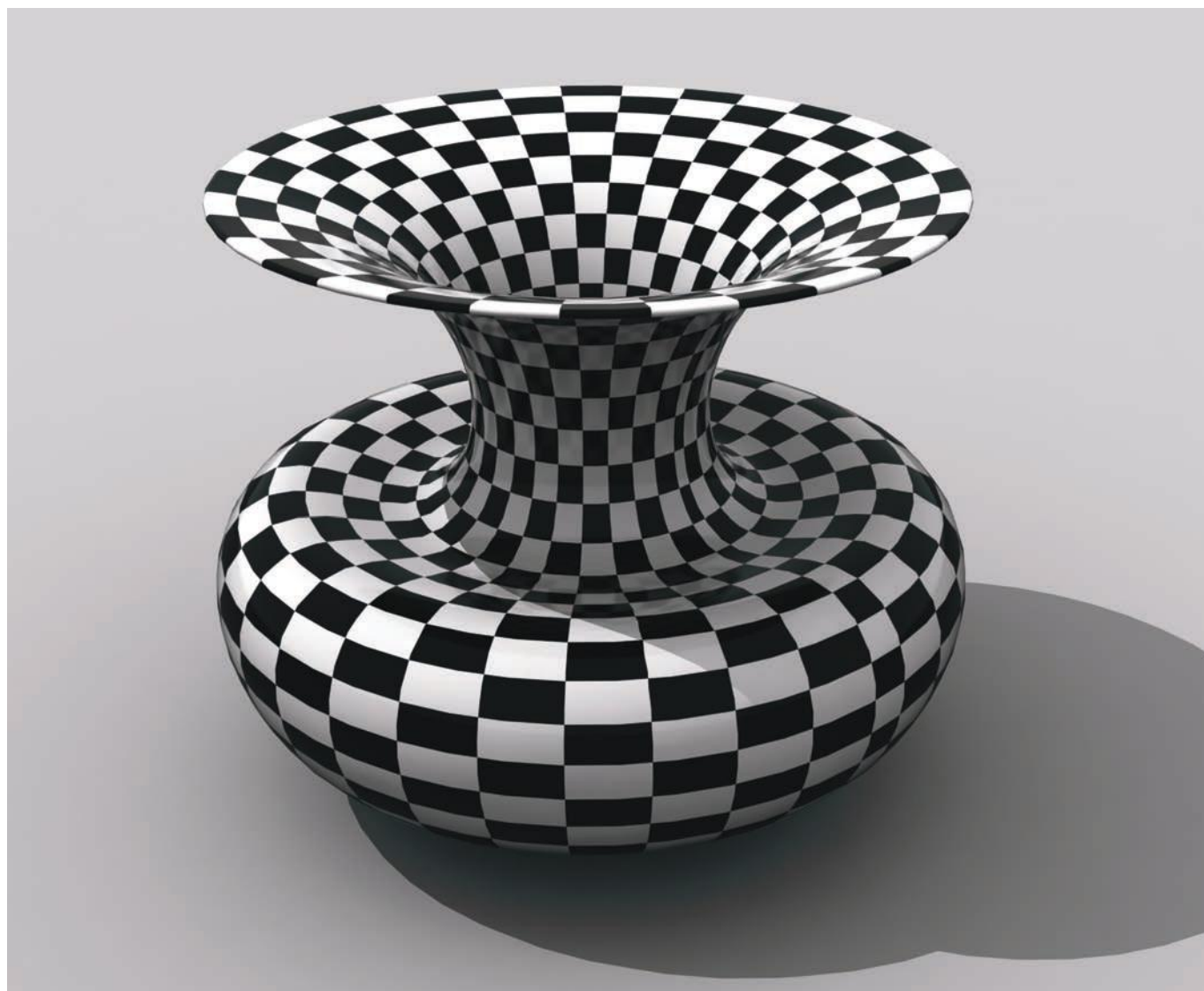
**2** Spline shape section profile. Adjust the spline to create a section profile. In this case the spline was offset using the Edit Spline Outline tool to provide the section profile with some thickness, and two vertices were filleted to round off the end of the profile.



**3** Creating a lathe mesh. Select the section profile spline. Create a lathe mesh using the 'lathe' modifier from the modifier list.



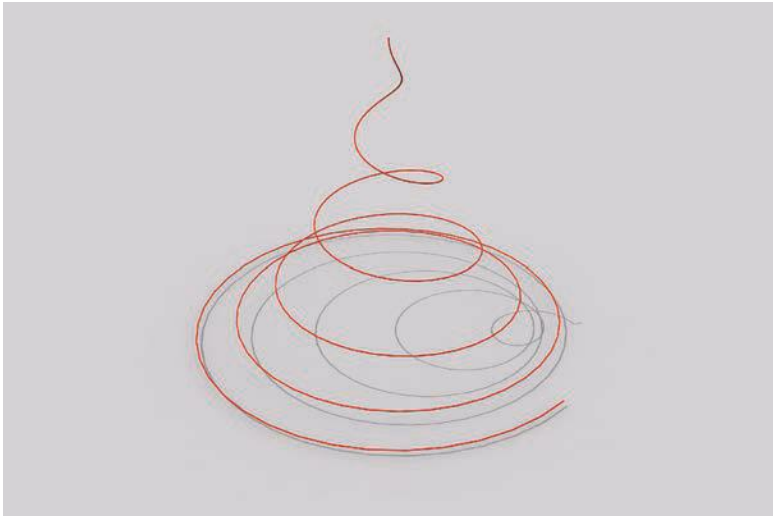
**4** Lathe mesh. Adjust the Lathe modifiers parameter settings to refine the mesh.



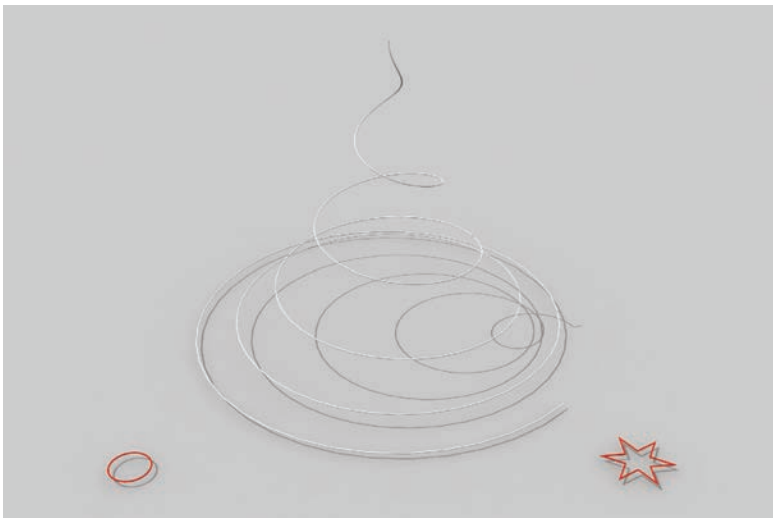
5 Mapping a material. A material was assigned to the surface. The mapping coordinates were set using the lathe meshes' built-in mapping system.



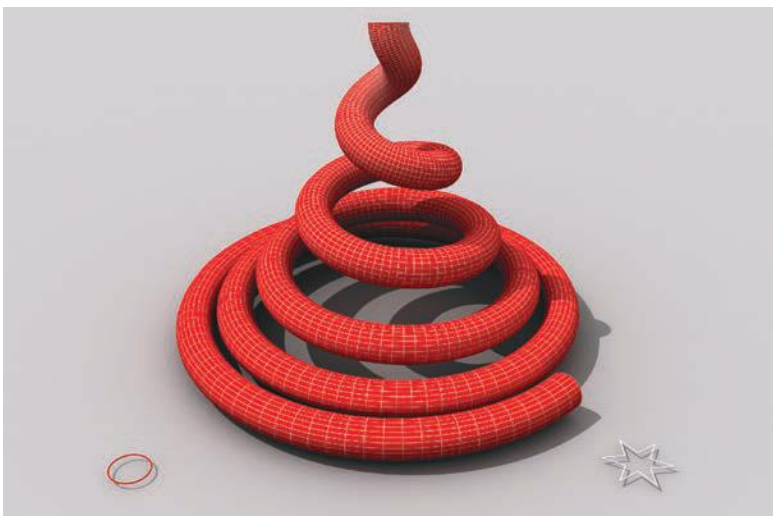
## STEP BY STEP CREATING A LOFT MODEL



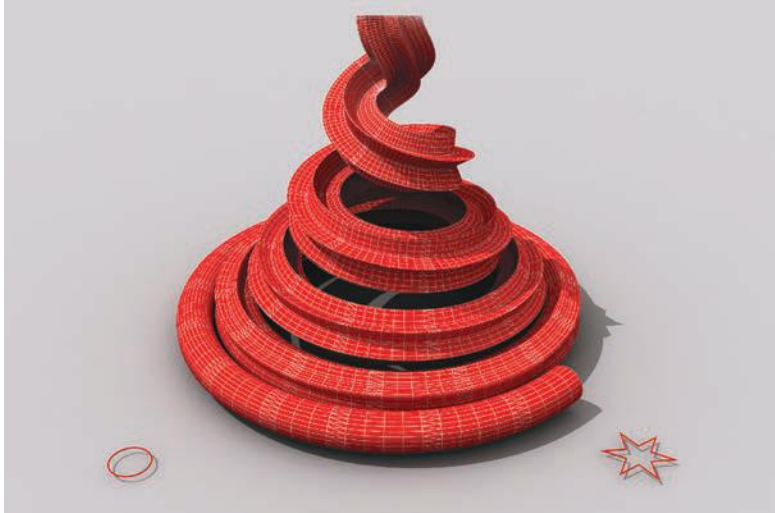
**1** Spline path. Create a path from a spline. In this case the Helix was used.



**2** Spline shapes. Create spline shapes. In this case a Circle and Star were used.

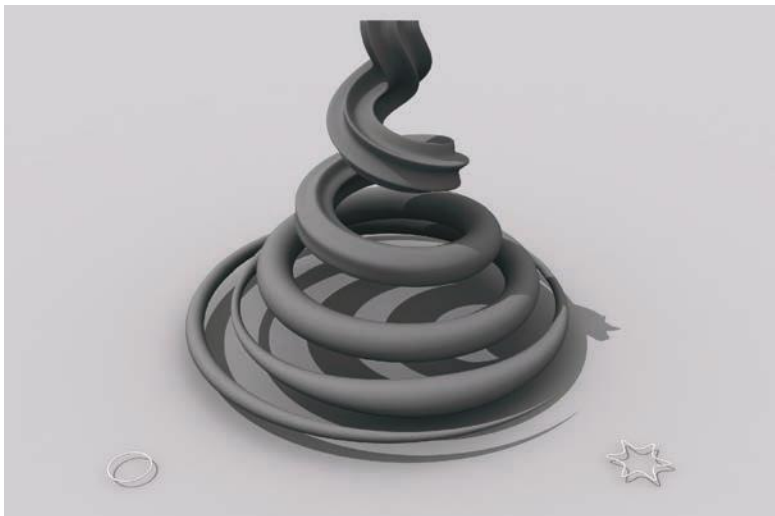


**3** Loft circle. To create a mesh object, first select the path spline. From loft parameters under Creation Method add the Circle spline shape using the Get Shape button. The order in which the splines are selected is crucial. If the path spline is selected first and the shape spline added subsequently, the mesh created would be located exactly where the path spline is. If the shape spline is selected first and the path spline chosen subsequently, the mesh created will be located where the shape spline is.



- 4 Add star to loft. To form a more complex mesh, any number of other shape splines can be added to the loft. To add another shape spline, first determine where you want the shape spline to appear along the path using Path Parameters and simply add the additional shape spline using the Get Shape button.

In this case Path Percentage was used and the star shape spline was added at 100% (the end of the path spline).



- 5 Refine mesh. To refine the mesh further, the positions of the shape splines were adjusted and the shape splines scale was adjusted at various points along the path spline using the Scale deformation graph.

To refine and position the blend between the circle shape spline and the star shape spline, the circle shape spline was placed at 0% and 80% and the star shape spline at 100% along the path spline. This resulted in the blend between the circle shape spline and the star shape spline occurring in the last 20% of the path's length instead of the blend occurring along the full 100% of its length.

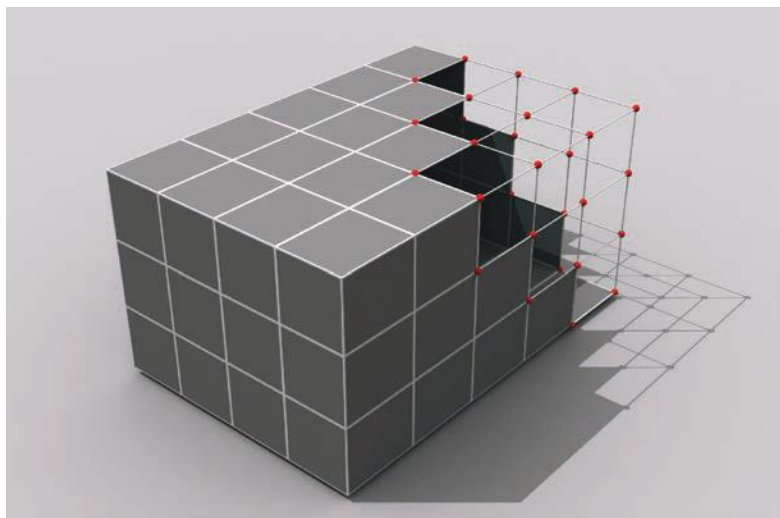
The star shape spline was modified to produce a softer-looking mesh by filleting the stars' points and adjusting the Fillet Radius under the star shape spline's parameters.



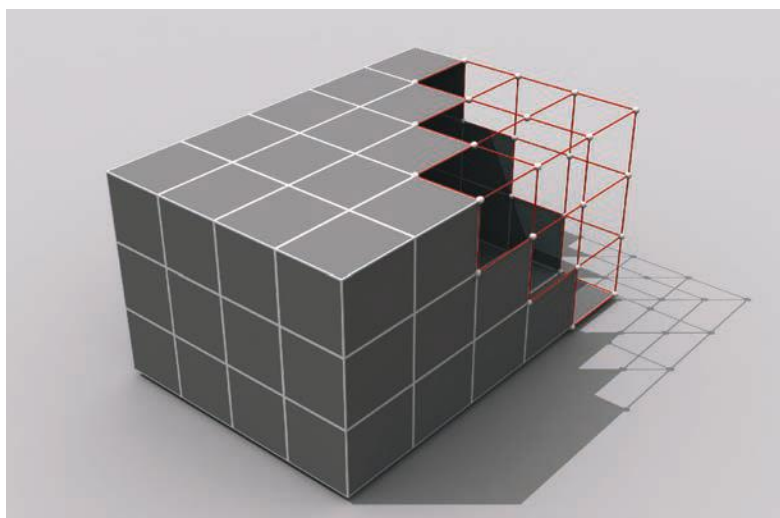
- 6 Mapping a material. A material was assigned to the surface. The mapping coordinates were set using the loft meshes' built-in mapping system.

## STEP BY STEP POLYGON MODEL EDITING

A Polygon mesh can be edited on a sub-object level (referred to as 'sub-object editing'). The key principle behind this form of mesh manipulation is that the modeller has access to the basic structural components that form a mesh. These components consist of vertices, edges and polygons that can be manipulated to alter the form of the mesh.

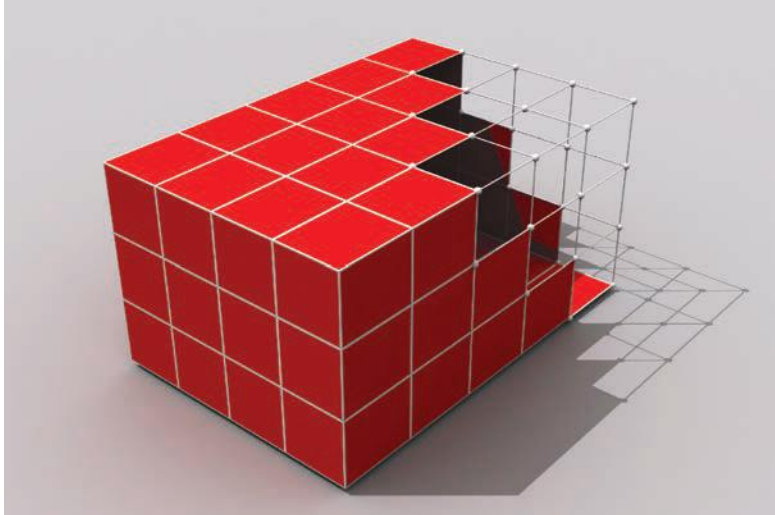


**1** Vertices. A vertex is the most basic element of a mesh. Vertices are single structural points that define the corners of each face within the mesh.

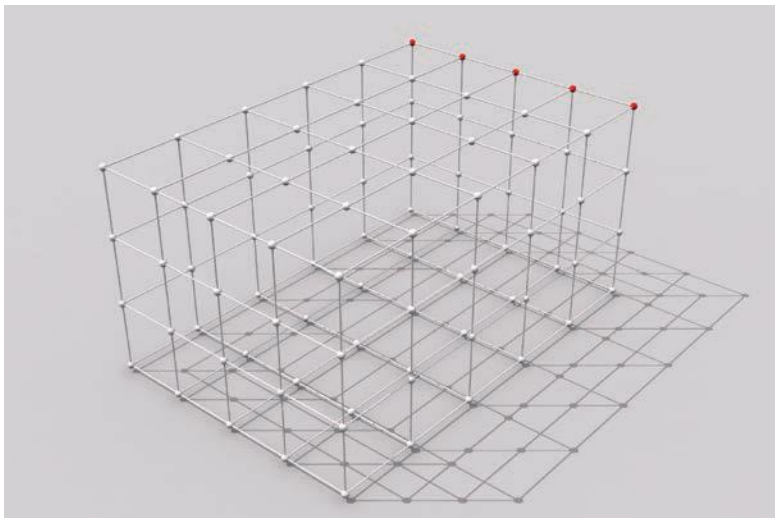


**2** Edges. Edges are the second most basic element of a mesh. Edges tie the vertices together to form the edges of faces within the mesh.

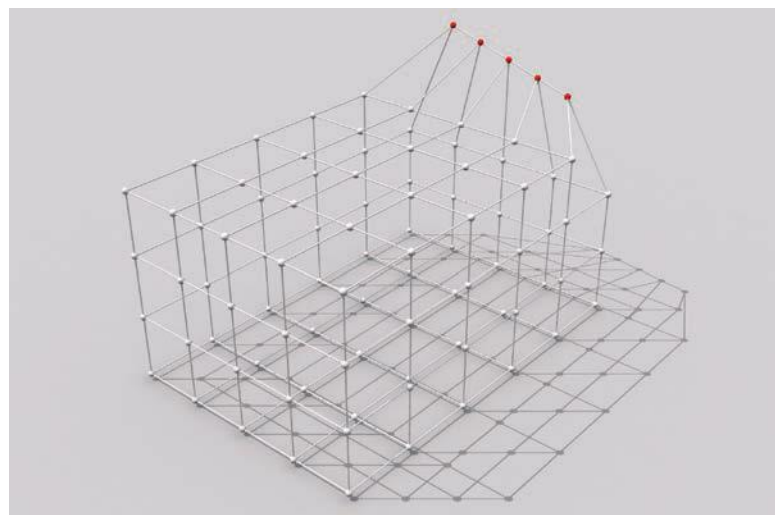




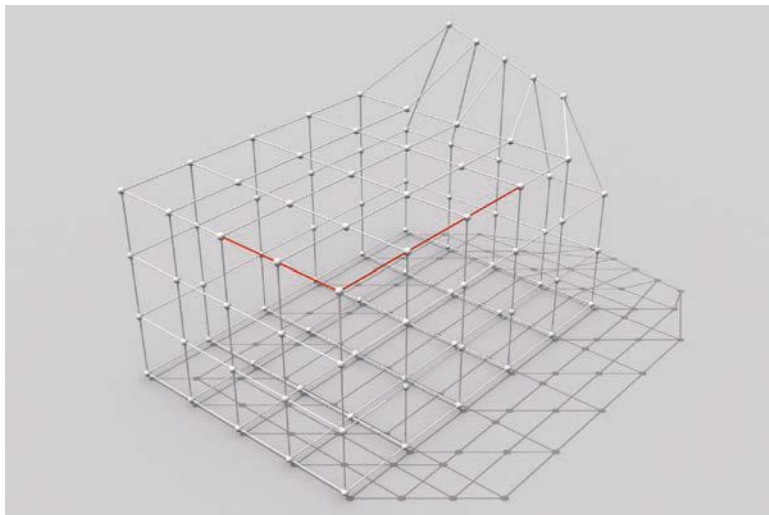
**3** Polygons. Polygons are formed by connecting vertices and edges together. Polygons are a series of faces that are connected to form a mesh.



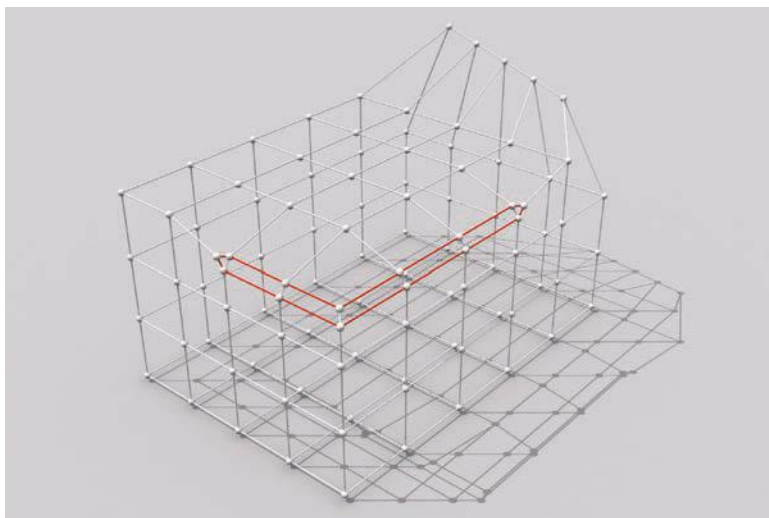
**4** Select vertices. Adjusting its vertices can modify a mesh. The desired vertices must first be selected.



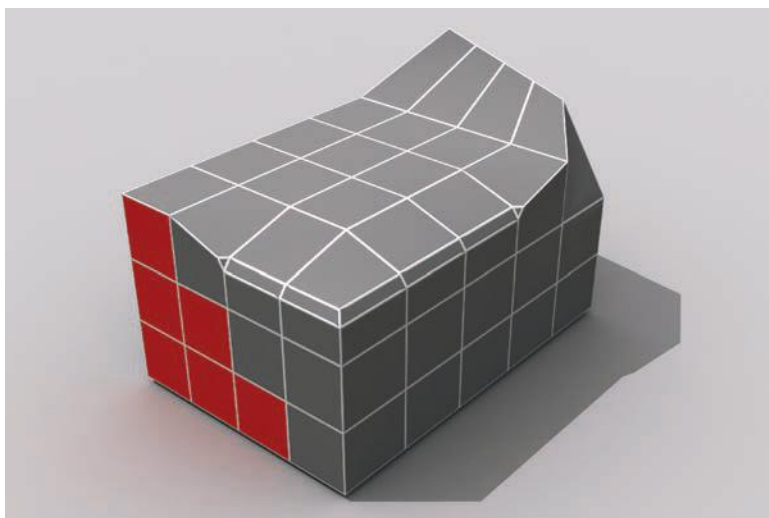
**5** Edit vertices. The selected vertices can be manipulated using the Move, Rotate and Scale tools. Additional editing tools are available within the Modify tab for manipulating the mesh's vertices.



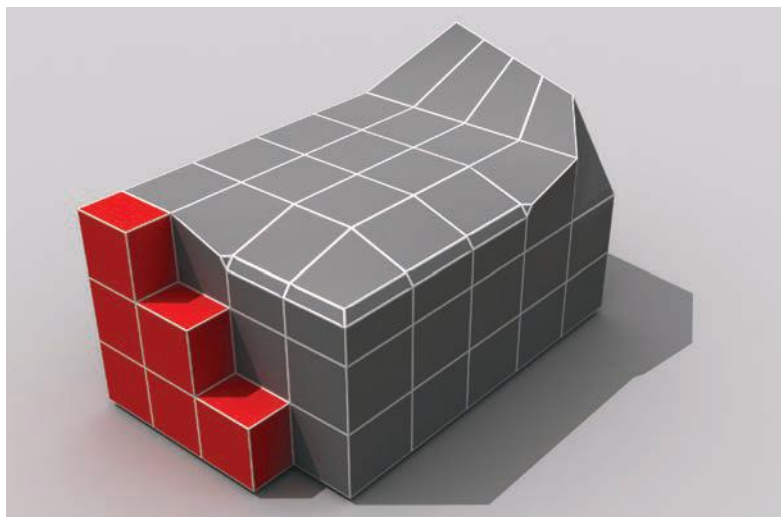
**6** Select edges. Adjusting its edges can modify a mesh. The desired edges must first be selected.



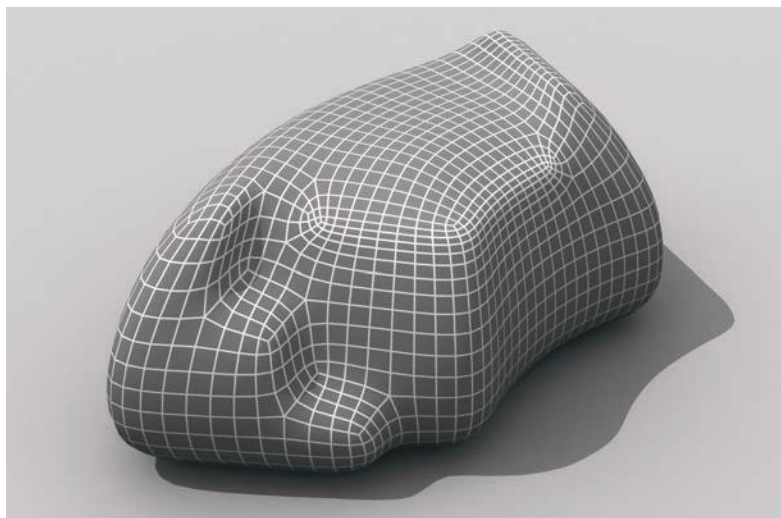
**7** Edit edges. The selected edges can be manipulated using the Move, Rotate and Scale tools. Additional editing tools are available within the Modify tab for manipulating the mesh's edges. In this case a Chamfer tool was used to chamfer the selected edges.



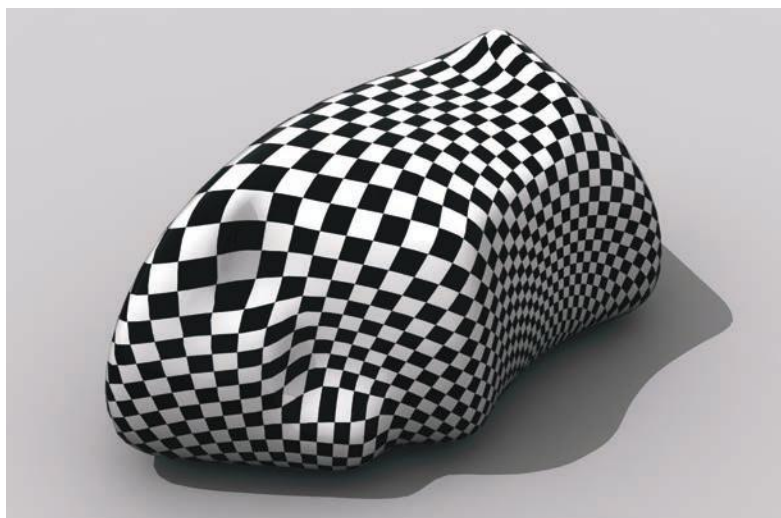
**8** Select faces. Adjusting its polygons can modify a mesh. The desired polygons must first be selected.



- 9 Edit faces. The selected polygons can be manipulated using the Move, Rotate and Scale tools. Additional editing tools are available within the Modify tab for manipulating the mesh's polygons. In this case the polygons were extruded using the Extrude tool.



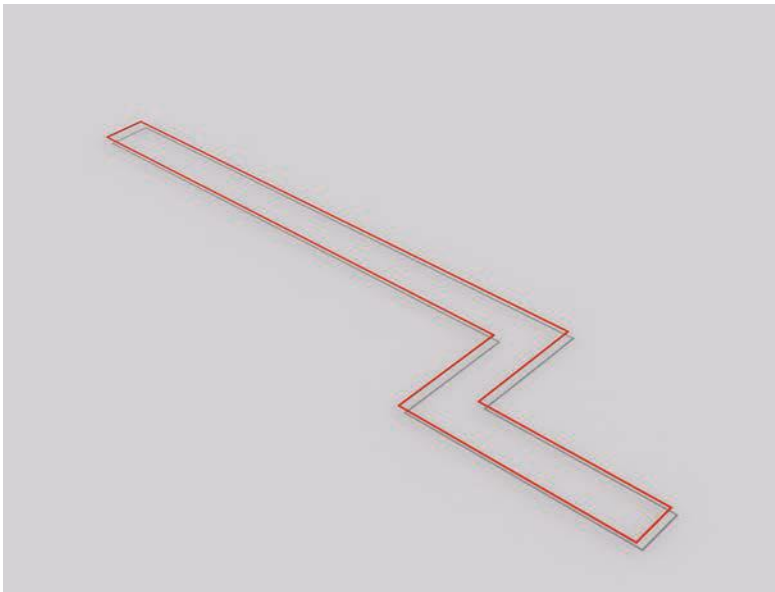
- 10 Using modifiers. Modifiers can be applied to the mesh to further alter its form. In this case the Turbo Smooth, Bend and Taper modifiers were used to further manipulate the mesh's form.



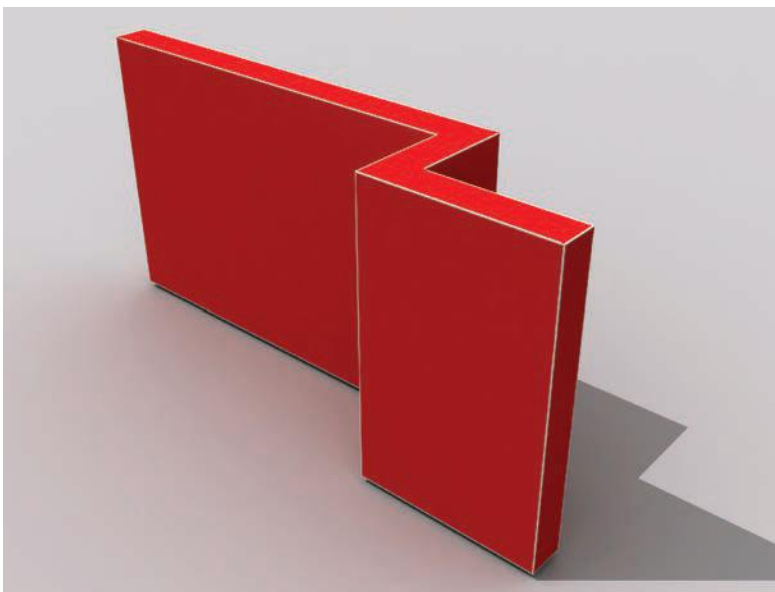
- 11 Mapping coordinates. A material was assigned to the surface. The UVW Map modifier was used to map the material correctly onto the surface.



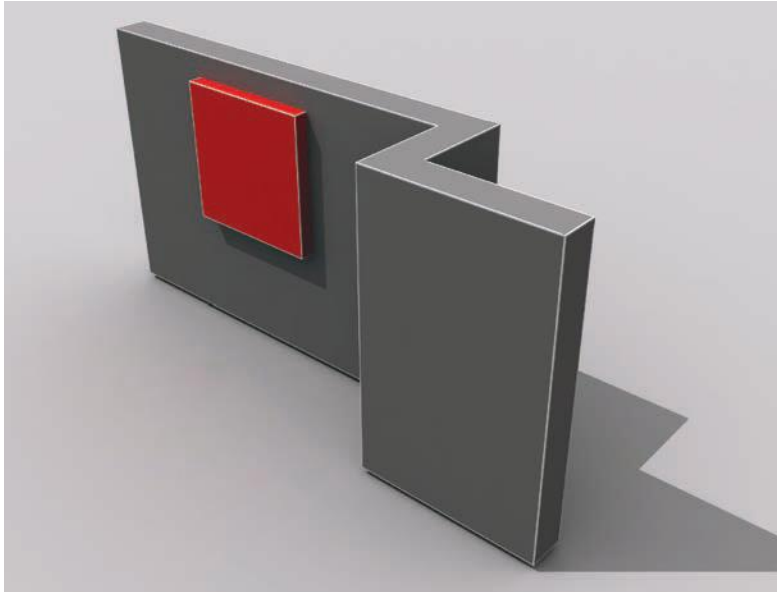
## STEP BY STEP SOLID MODEL EDITING



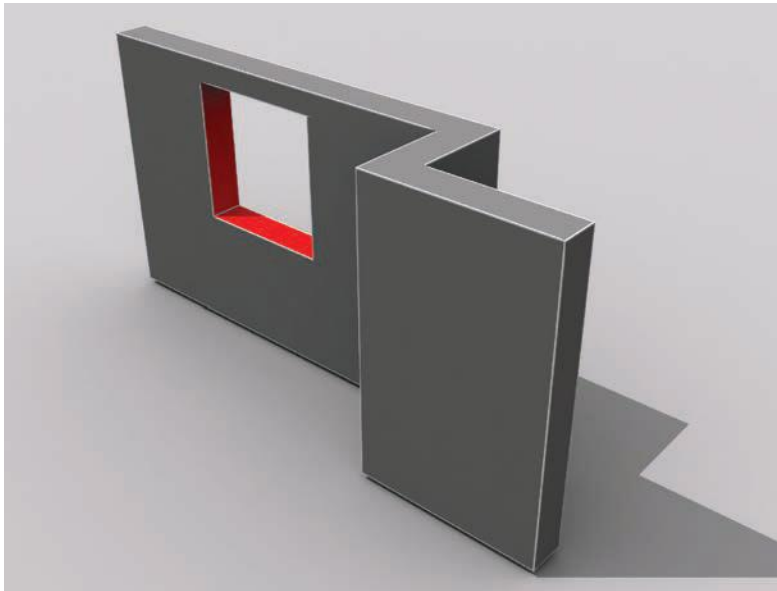
**1** Spline shape. Create a spline shape using the Line tool.



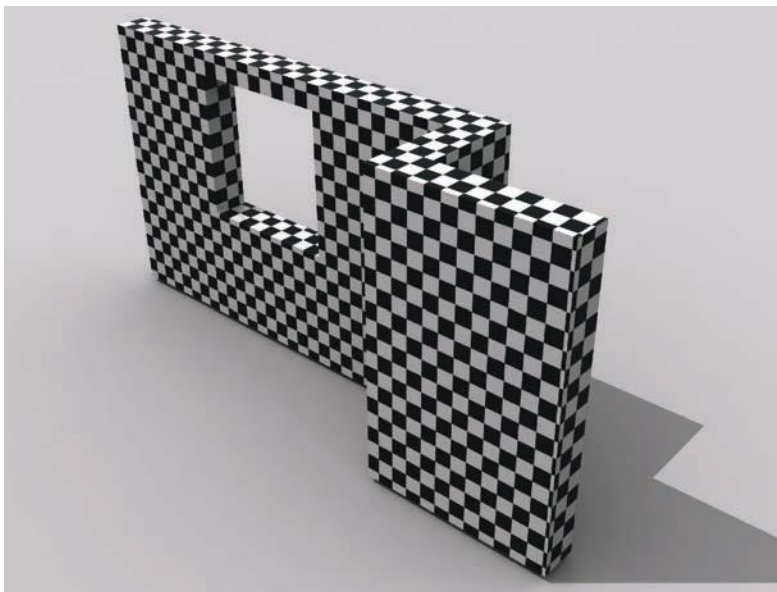
**2** Extrude the spline. Extrude the spline to make a solid mesh using the Extrude modifier from the modifier list.



- 3 Position mesh object to subtract. Create a smaller mesh object to subtract from the large mesh. In this case a box was created from the standard Primitives menu. Position the smaller mesh object using the Move tool.

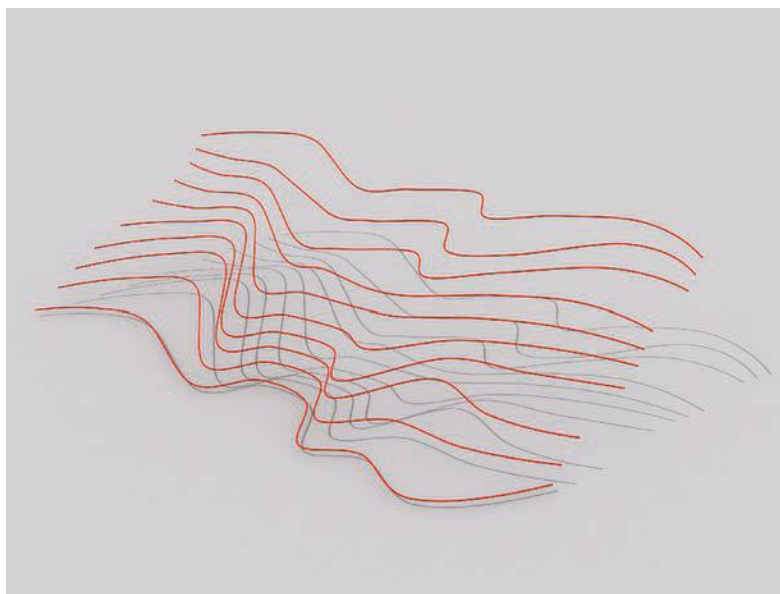


- 4 Boolean operation. Select the large mesh to be retained. Use the Pro Boolean tool, then select Subtraction from the Boolean parameters and pick the small mesh object. Make sure there is a good overlap between both mesh objects so that a clean cut is made.

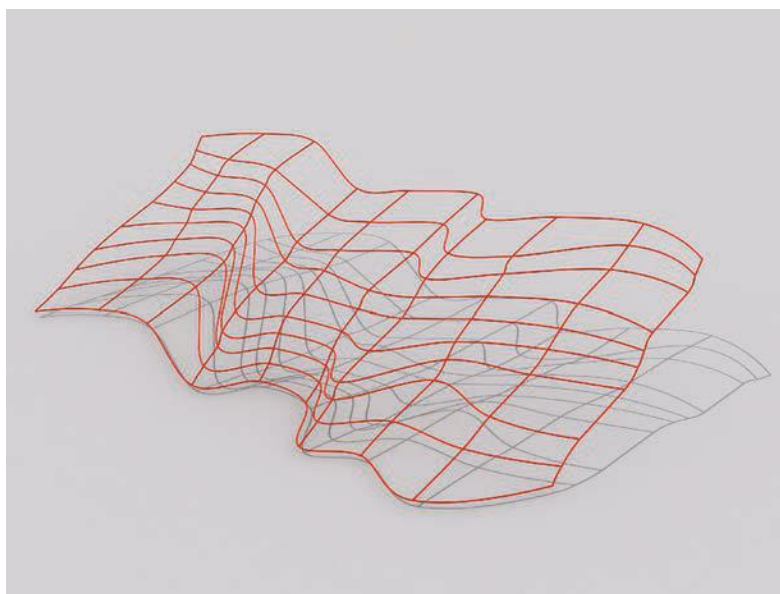


- 5 Mapping a material. A material was assigned to the mesh object. The UVW Map modifier was used to map the material correctly onto the mesh object.

## STEP BY STEP CREATING A SPLINE SURFACE MODEL



- 1 Splines. Create required spline shapes using the Line tool. For multiple splines, attempt, where possible, to use an equal number of vertices on each spline. Create one spline object by attaching all the splines together. When attaching the splines, select the lowest spline and attach each spline in order of sequence.

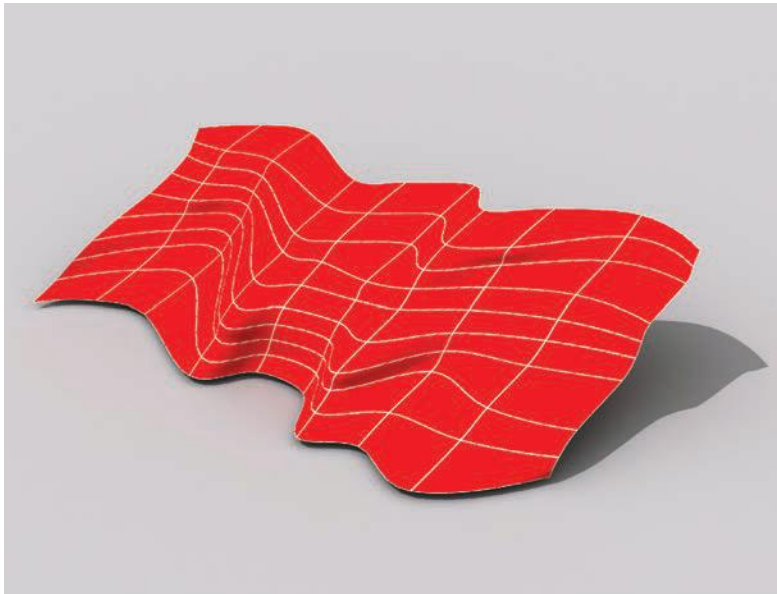


- 2 Spline cage. Create a spline cage by connecting the vertices with new splines to form a closed lattice made up of three- or four-sided shapes. The Cross-section modifier can be used, or connect the vertices manually using the Create Line tool from within the Edit Spline parameters.

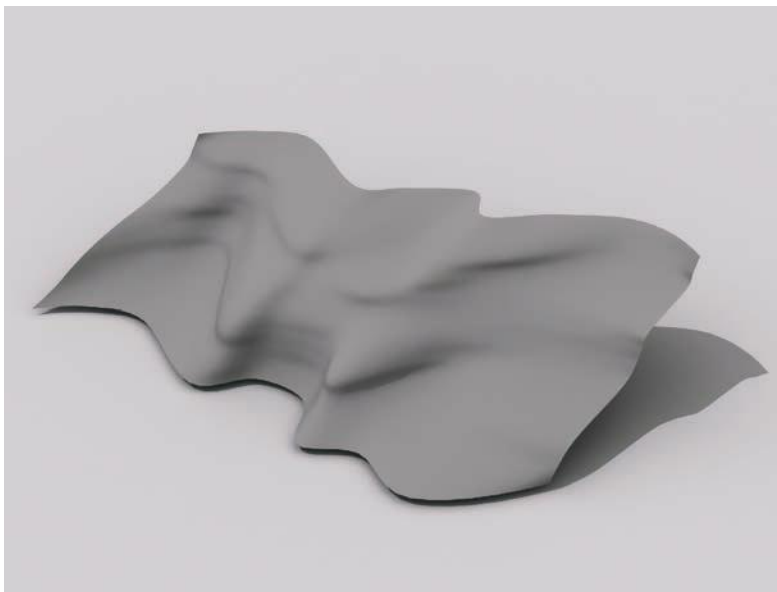
When creating the splines manually, make sure the vertices align properly by using the 3D Snap function.

When using the Cross-section modifier, the first vertices of each spline should all start at the same side so that the modifier works correctly.

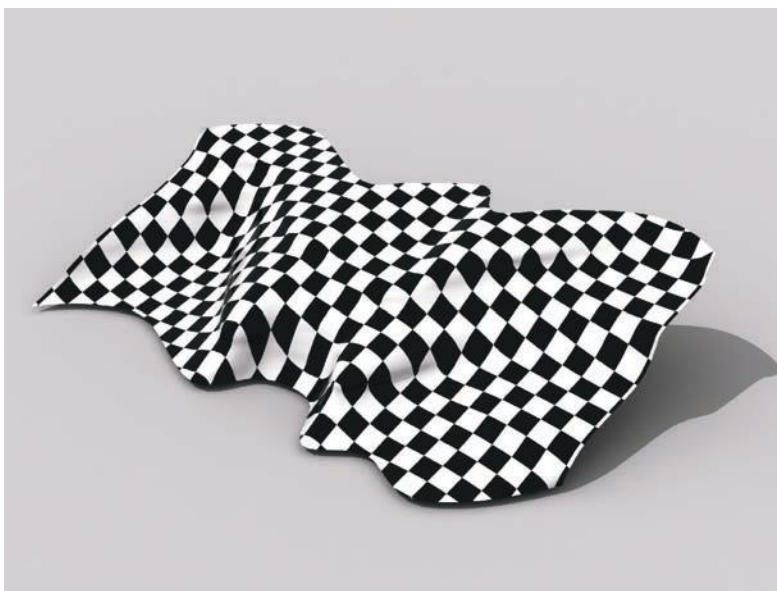




- 3 Surface. Use the Surface modifier to create surface mesh over the spline cage.



- 4 Surface final. Adjust the parameters for the Surface modifier to suit. The spline cage must be made of a three- and/or four-sided grid to prevent any holes from appearing in the surface mesh. At the junction where two splines cross, the two respective vertices must align exactly so that the surface mesh is created properly.



- 5 Mapping a material. A material was assigned to the surface. The UVW Map modifier was used to map the material correctly to the surface.

# STEP BY STEP USING AFTER EFFECTS FOR ANIMATION

Our experience of architecture always involves movement and time. In order to show, say, the passage of people or light in a space, drawings need to be animated. In the following sequence, architect Maria Vasdeki explores simple tools that help us to explore movement. She creates a 'time lapse' animation for a courtyard in Adobe After Effects, using still 2D texture images and a series of clay renders.

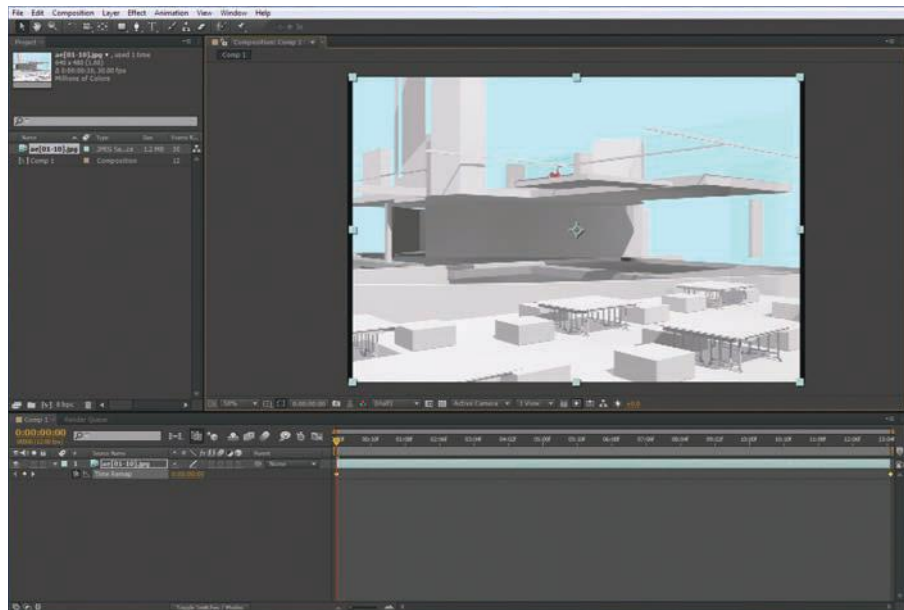
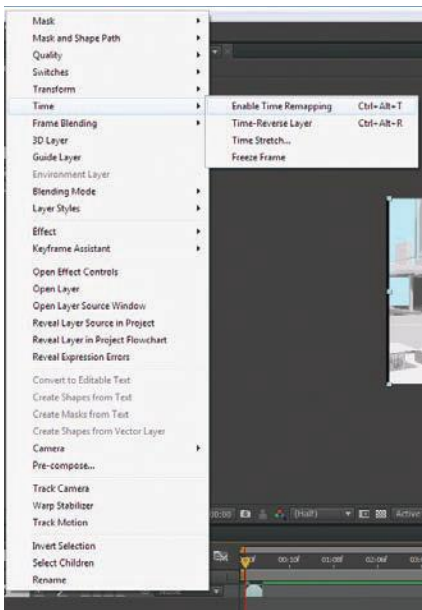
## 1: Setting up a project

To make a new composition, go to Composition>New Composition. The required resolution, frame rate and duration values can be specified in the Composition Settings dialogue box. In this particular animation, these were set to 720x480, 12 fps, and 0:01:50:11 respectively.

Next, import your project files, File>Import>File. The first files imported here were clay renders, imported as Footage, with the JPEG Sequence option checked on.

By turning the JPEG Sequence option on, the two clay renders are introduced to the project as one project file, where each still image is used as a frame. The project file is now added to the composition.

The length of the sequence is adjusted by right-clicking on the Sequence layer in the composition and selecting Time>Enable Time Remapping, stretching the length of the layer and using keyframes to arrange the timing of the stills within the sequence.



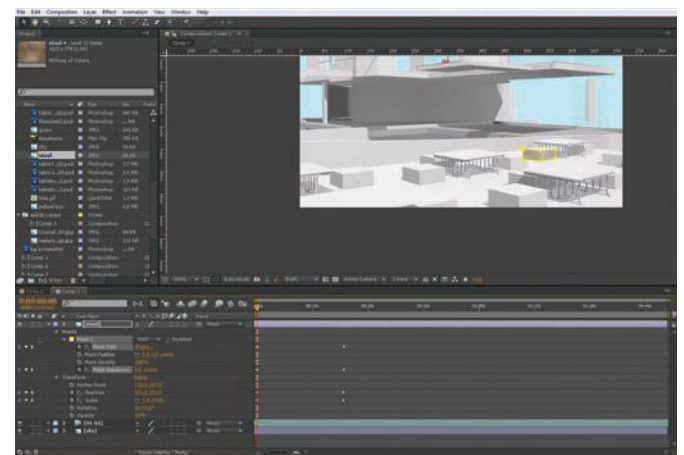
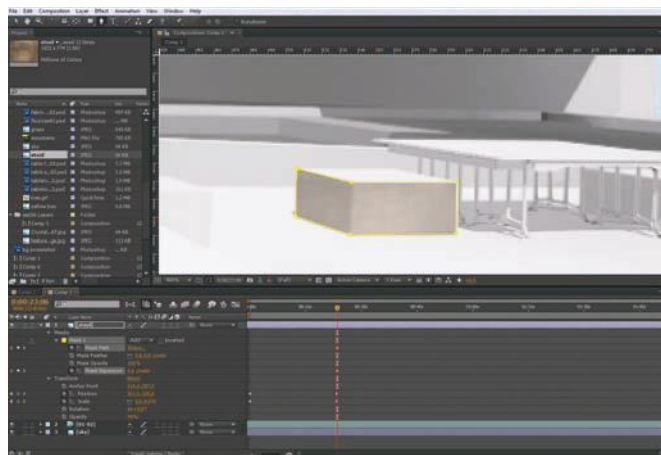
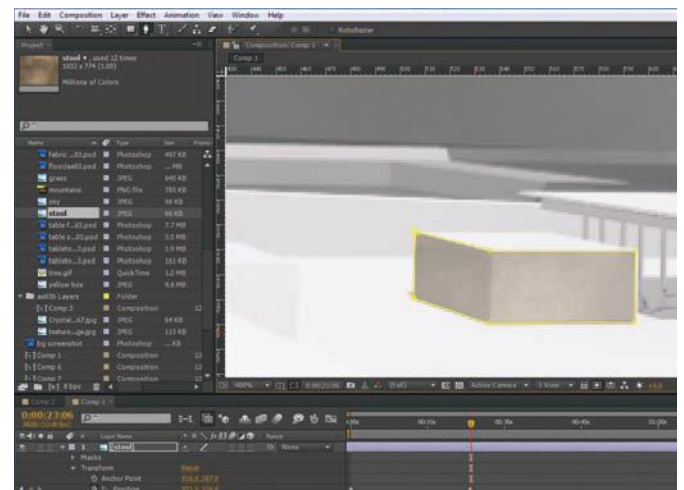
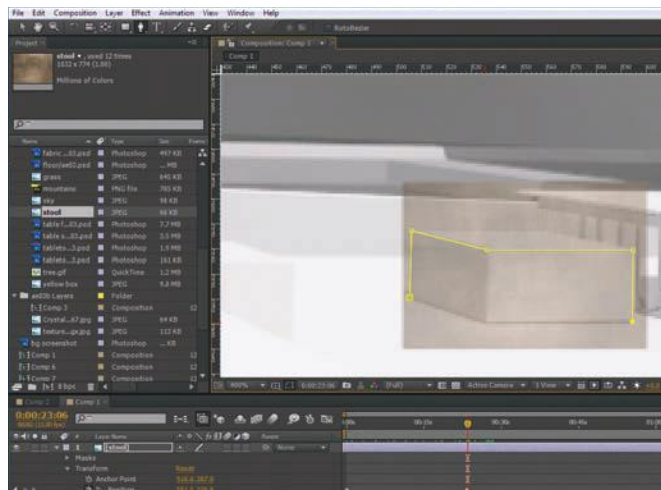
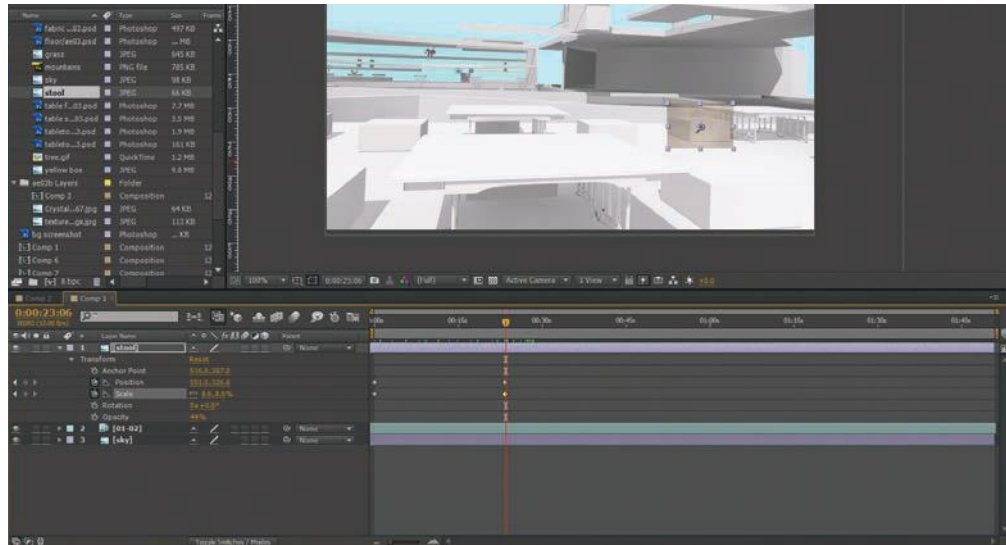
Layered PSD files are imported as Compositions, with layered styles merged into the footage. Merged PSD files are imported as Footage. The rest of the files are then imported into the project in the same way.

Where necessary, the frame rate of the project files is set by right-clicking on them and selecting Interpret Footage, and then selecting Main.

## 2: Animating 2D layers

### 2.1 Animating transformations

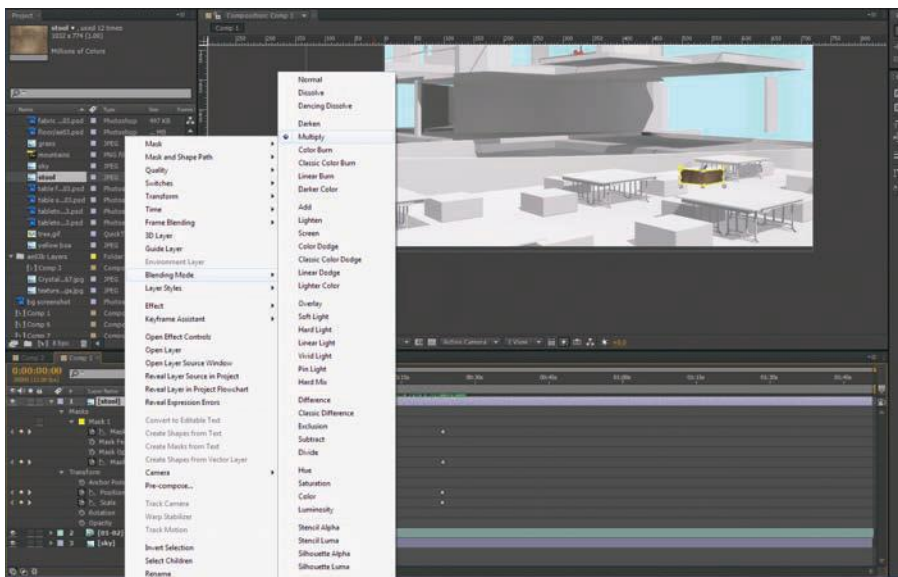
Each 2D layer is animated by activating the stopwatch, changing the layer's properties and setting keyframes at the times when the desired changes should take place.



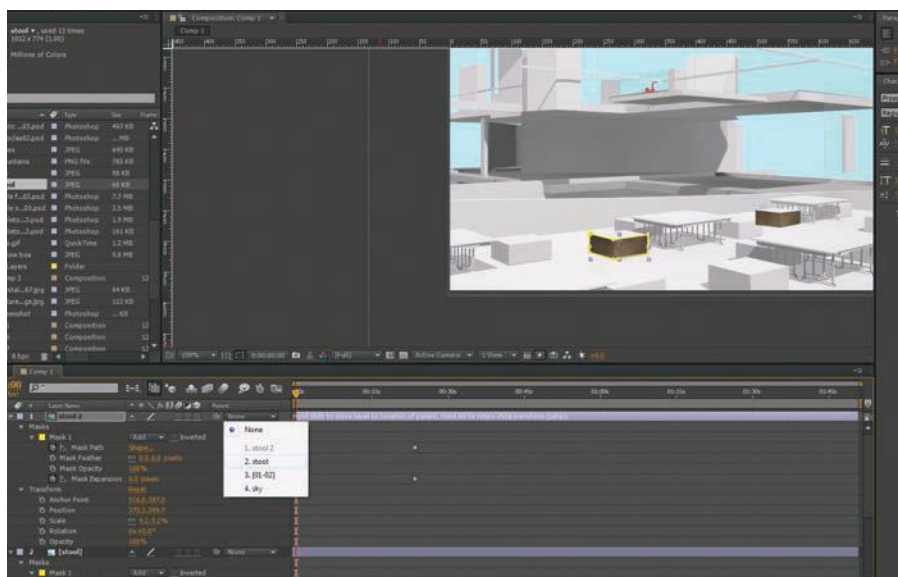
### 2.2 Animating masks

The masks below were created by using the Pen tool and drawing a path as shown. The Mask mode was set to Add and the stopwatch was activated for the properties Mask Path and Mask Expansion.



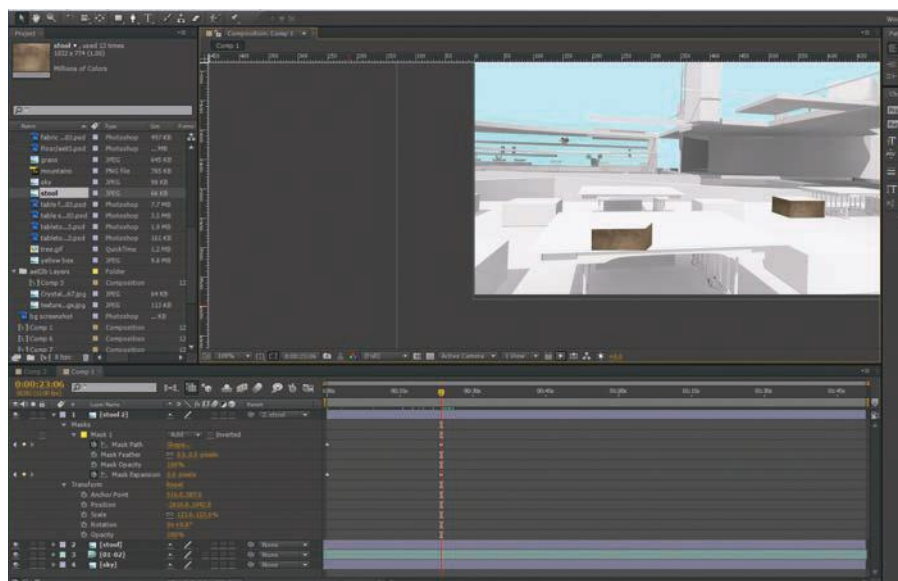


The layer's Blending Mode is now changed to Multiply. The Blending Mode menu can be accessed either via the Layer tab or by right-clicking on the layer and selecting Blending Mode.

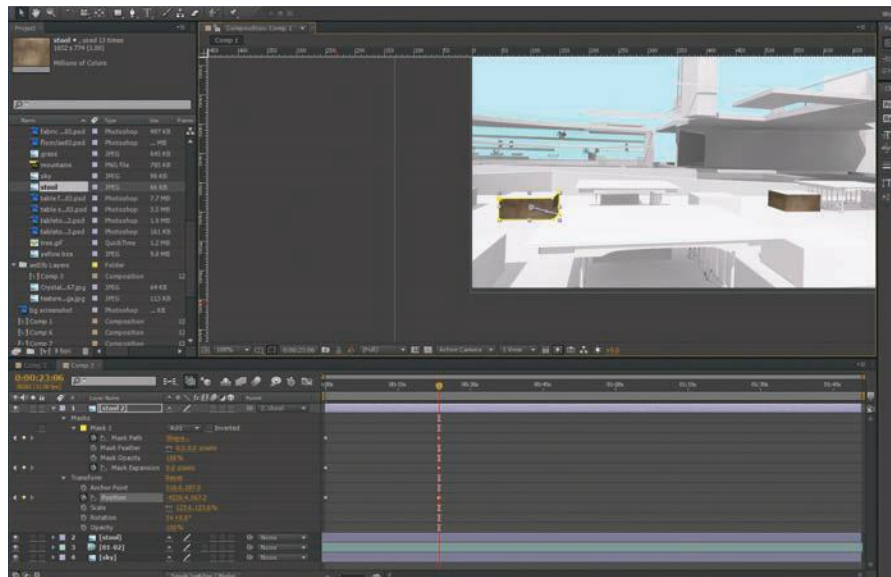


### 2.3 Parenting

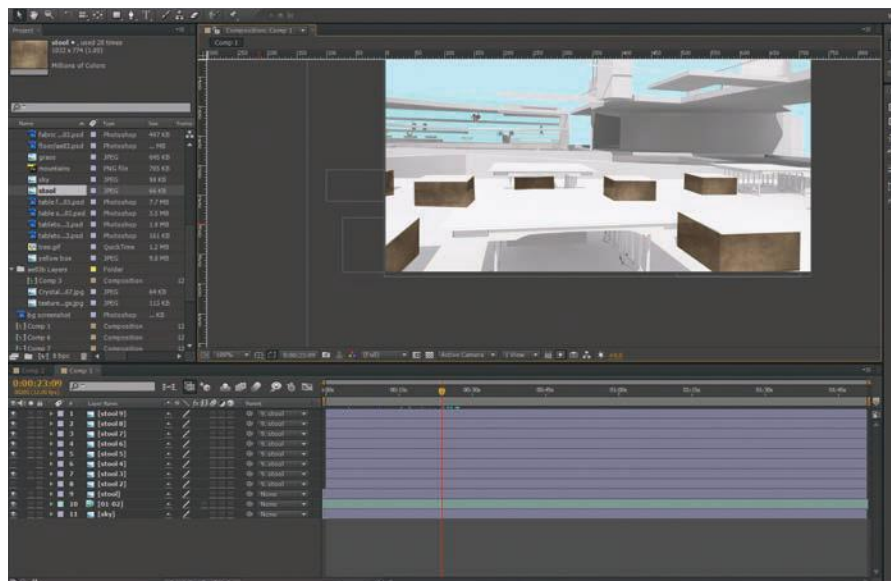
To make the second stool, a mask is created and keyframed as above. All other layer transformation properties remain as they were, but the Parent option is set to the layer animated previously.



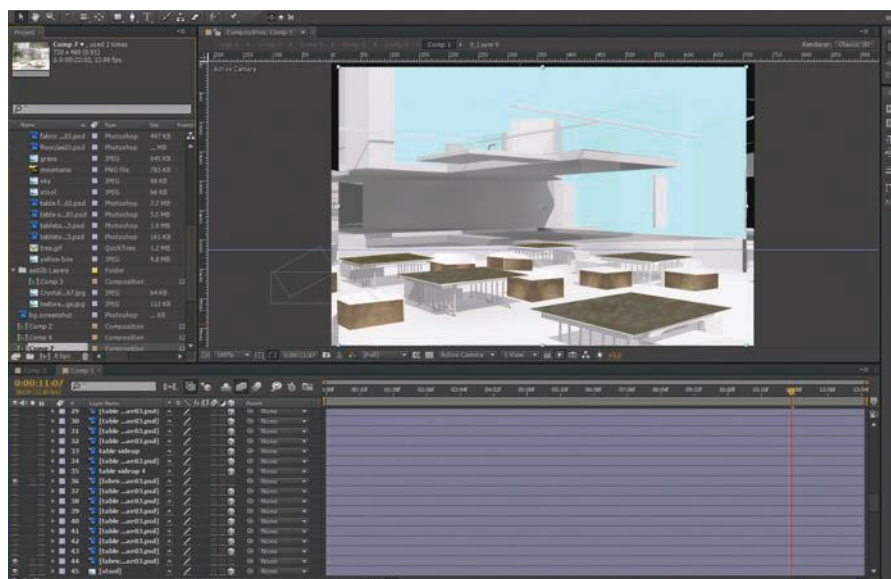
The Parent option essentially assigns the transformations of the Parent layer to the Child layer, while any transformations applied to the Child layer do not affect the Parent layer. For example, in this case, the resulting scale transformation was successful but the resulting position transformation was not the one that was wanted.



The position of the Child layer is altered to what is wanted, and then keyframed.

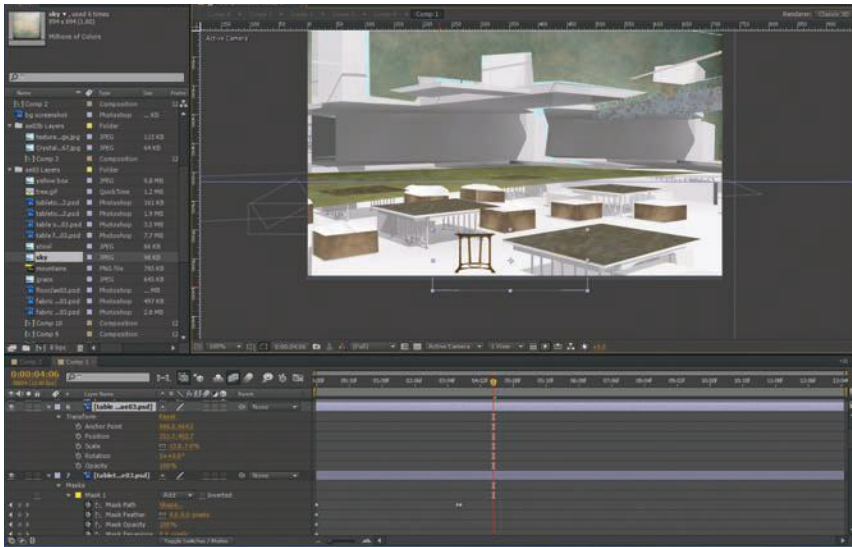


All other stool objects are made in the same way.



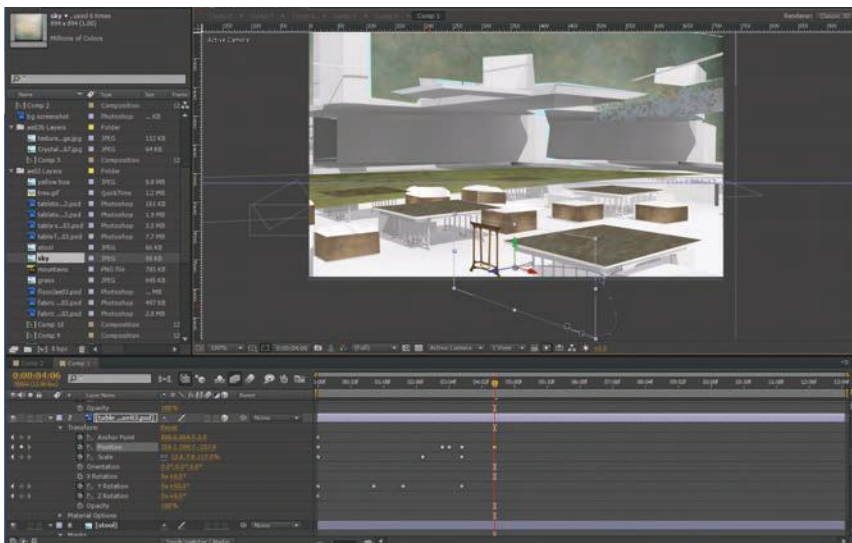
Steps 2.1 to 2.3 are repeated for the desk and cushion objects.

## 3: Animating 3D layers



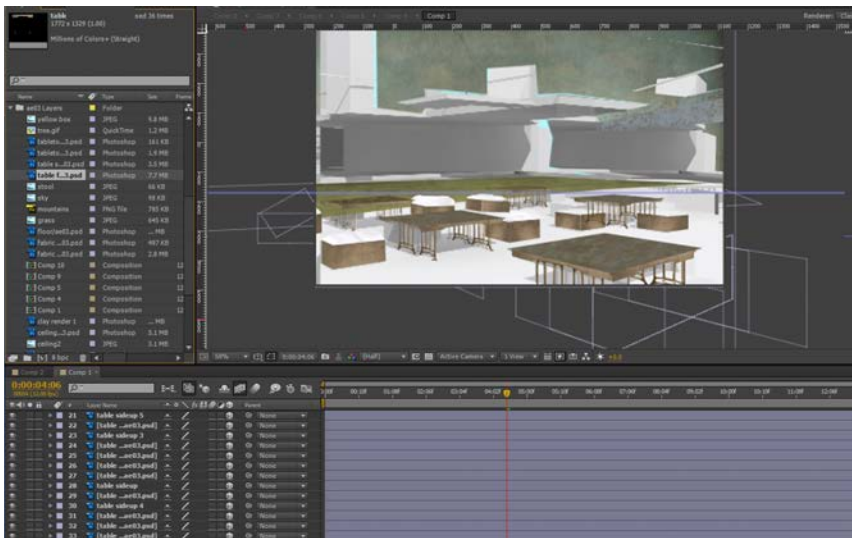
### 3.1 Converting a 2D layer into a 3D layer

A 2D layer can be converted into a 3D layer either by right-clicking on the layer and selecting 3D Layer from the drop-down menu or by clicking in the box underneath the cube icon, next to the Parent option.



### 3.2 Animating 3D layers

A 3D layer is animated using the same basic principles as a 2D layer but with the addition of a Z-axis transformation value. The 3D layer is still a flat layer, but its position, scale and rotation properties are now transformed along X, Y and Z axes. The table legs (shown here) were rotated around the Y axis and moved along the Z and X axes.

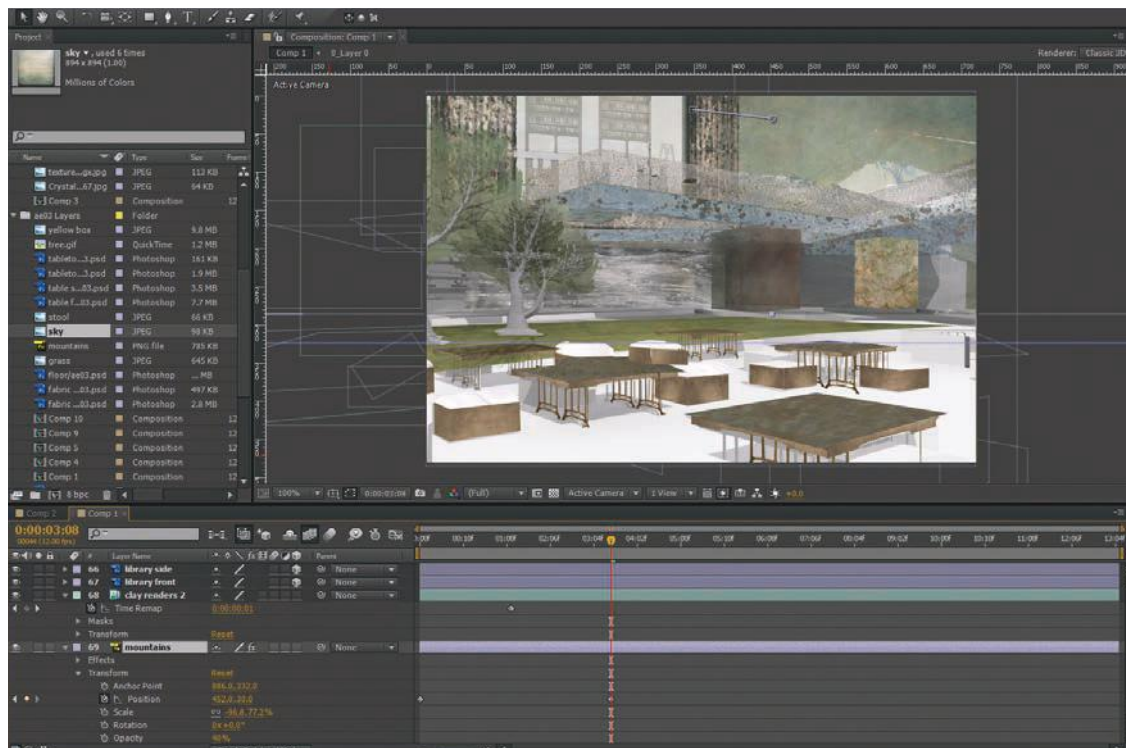
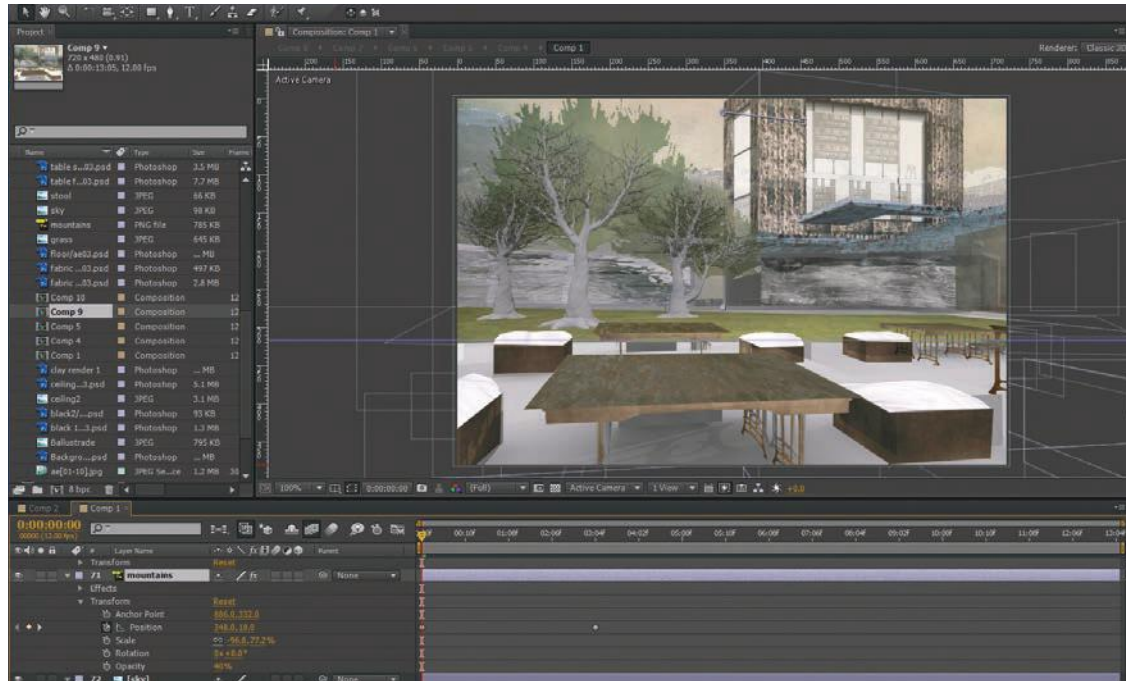


All other desk frames were then made following the previous steps.



## 4: Adding objects to the scene background

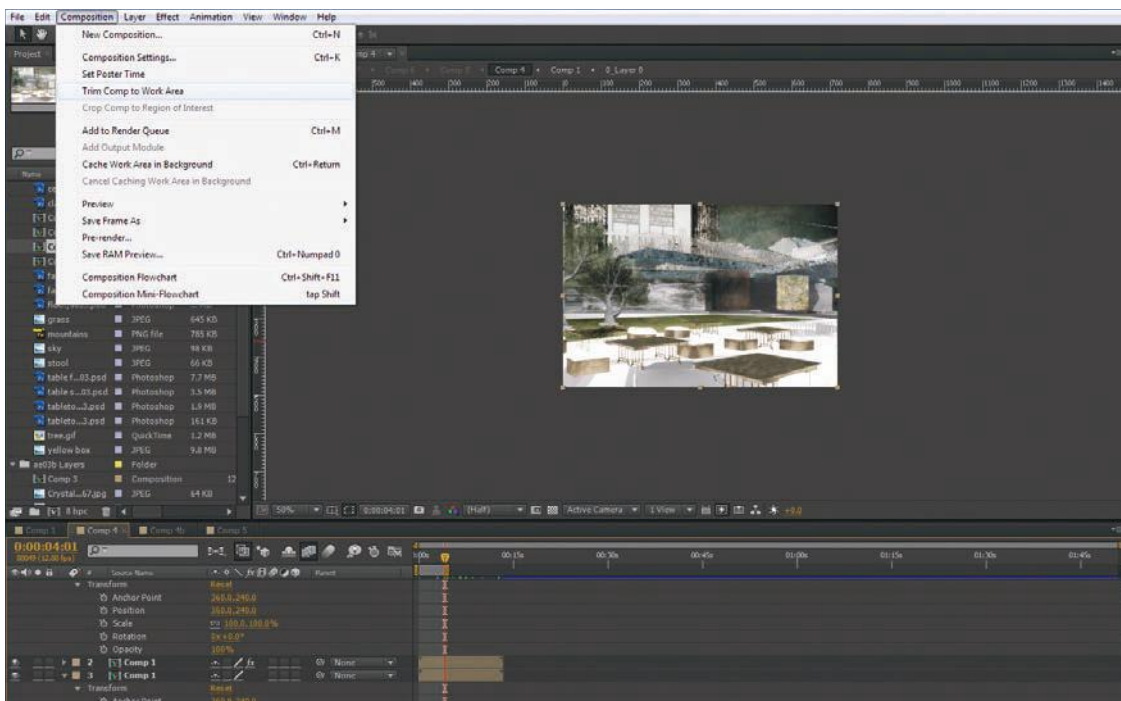
The 2D Trees layer is now parented to one of the cushion objects. The part of the library layer that should be hidden by the concrete slab was masked out by drawing a path with the Pen tool, setting the mask mode to Subtract and keyframing its Path and Expansion values.



## 5: Time alterations

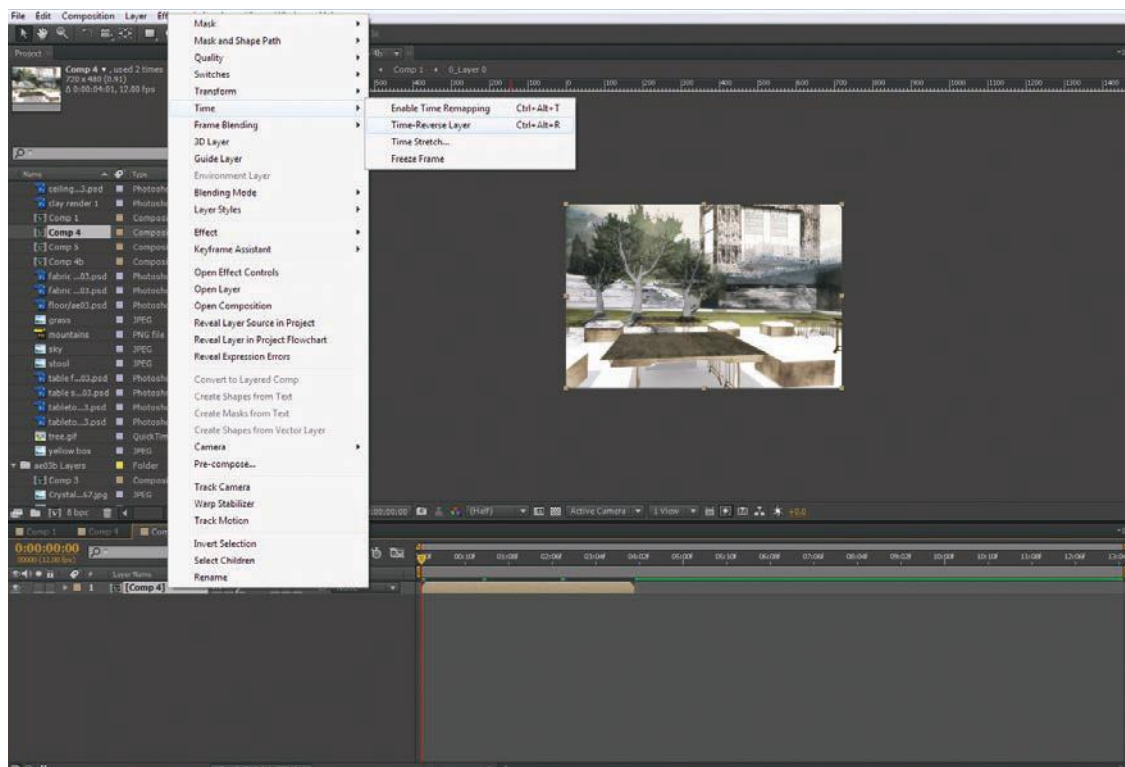
### 5.1 Removing excess time

After sliding the Work Area bar to the desired point, the option Trim Comp to Work Area is selected from the drop-down menu of the Composition tab.



### 5.2 Reversing a layer

A layer can be reversed by right-clicking it and selecting Time and then Time Reverse Layer from the drop-down menus.



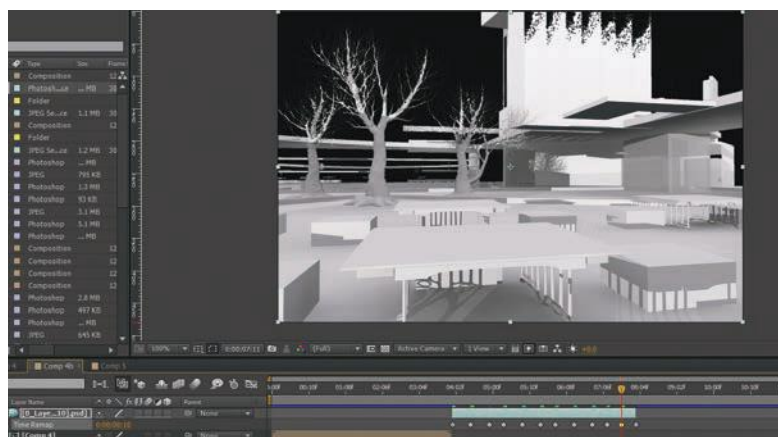
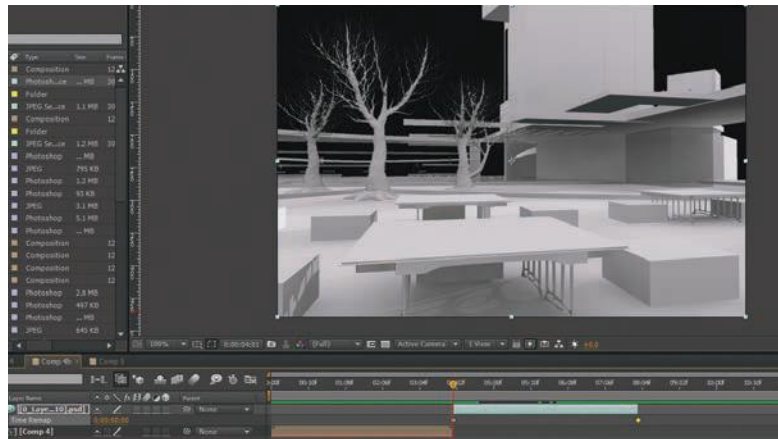
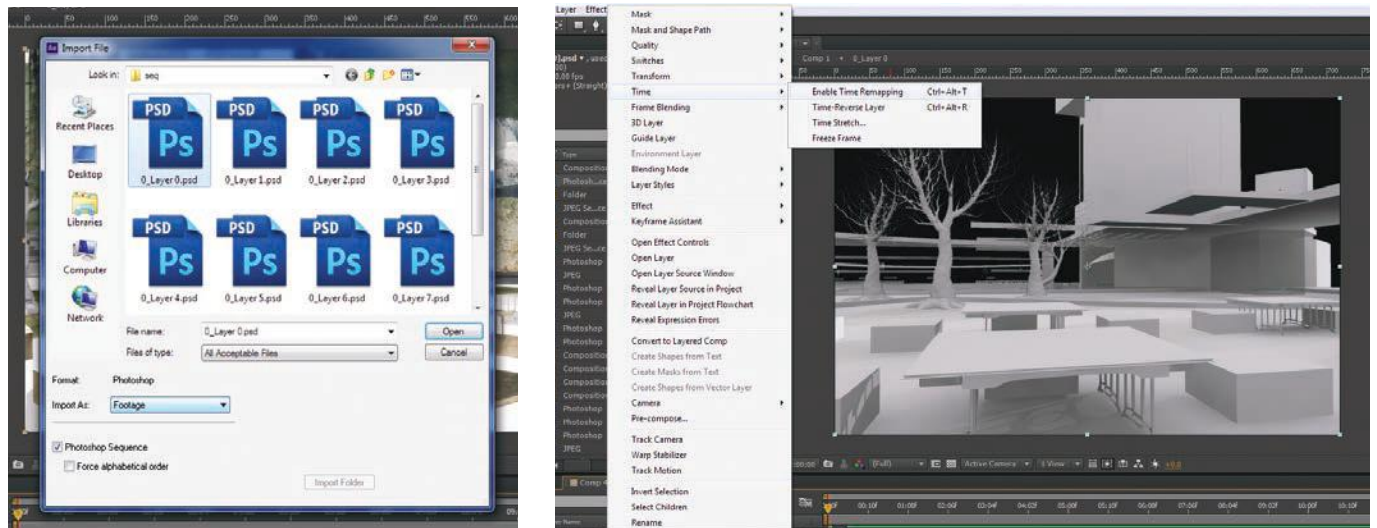
## 6: Adding shadows

Going back to the 3D model from which we took the clay renders used in the animation, a series of ten more clay renders was produced, using the same view as those in the animation but with different lighting applied in each one.

These were lightly touched up in Photoshop and then imported in the project file as a sequence.

A new composition was made, Composition 4b, and Composition 4 was placed in it along with the new clay render sequence.

Time Remapping was then enabled for the sequence.

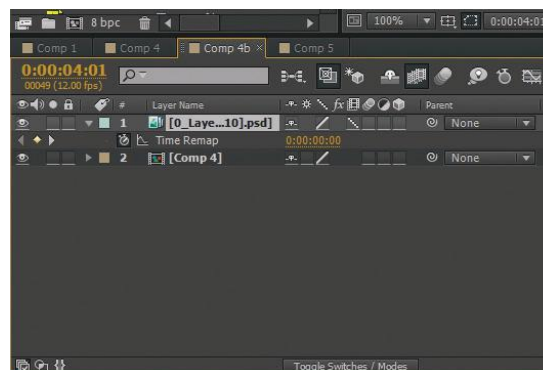
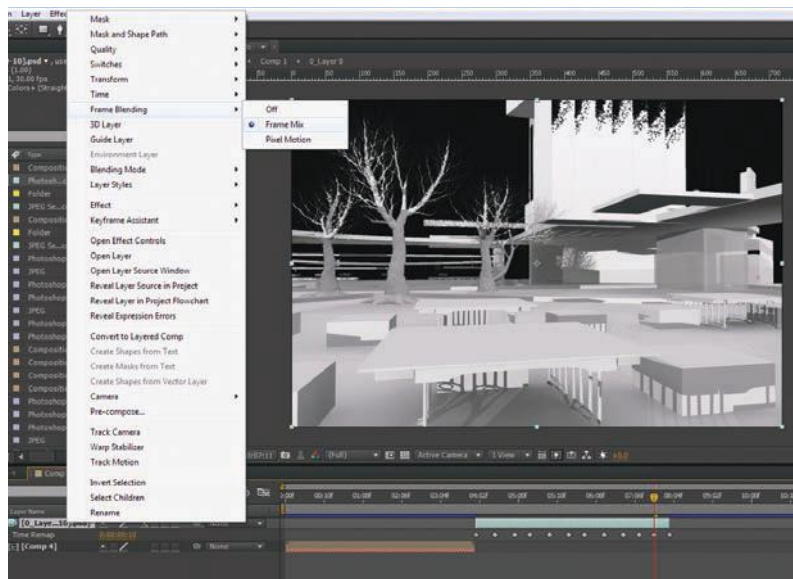


A keyframe was created for every still image contained in the sequence.



Next, Frame Mix is selected for a smooth transition between the stills of the sequence. Frame Mix can be enabled by right-clicking on the layer and then selecting Frame Blending and Frame Mix from the drop-down menus.

Frame Blending must also be enabled in the composition itself, which can be done by clicking on the Frame Blending switch, shown below.

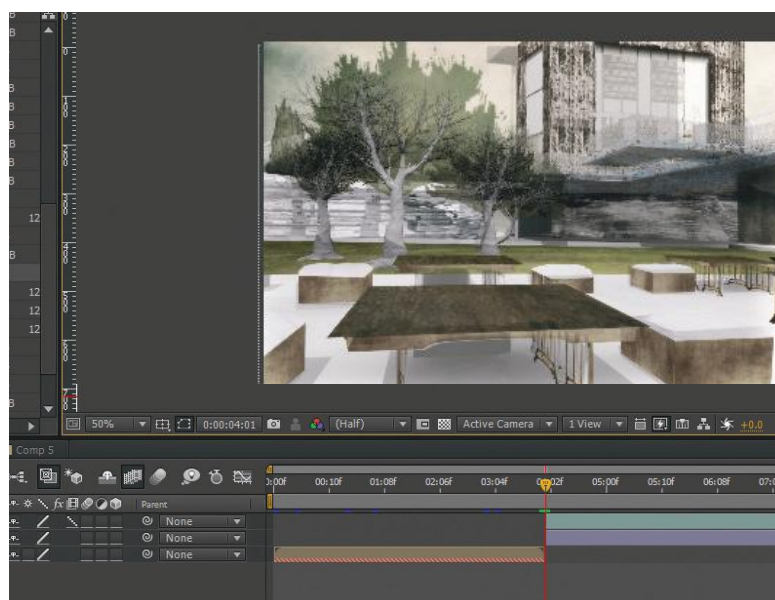
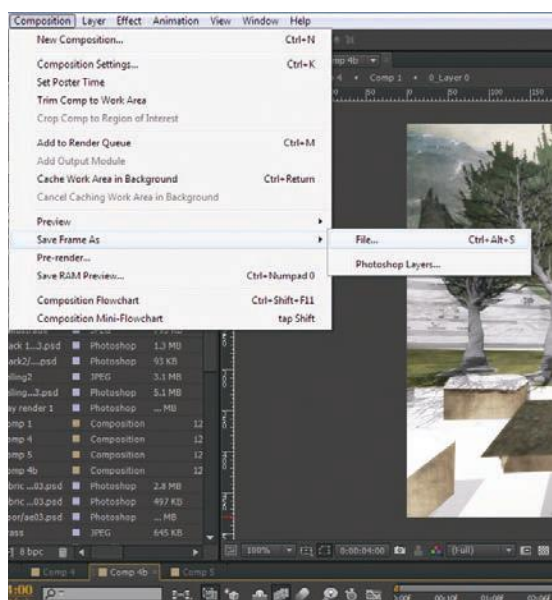


The sequence layer's Blending Mode was then set to Multiply and its opacity lowered by 50%.

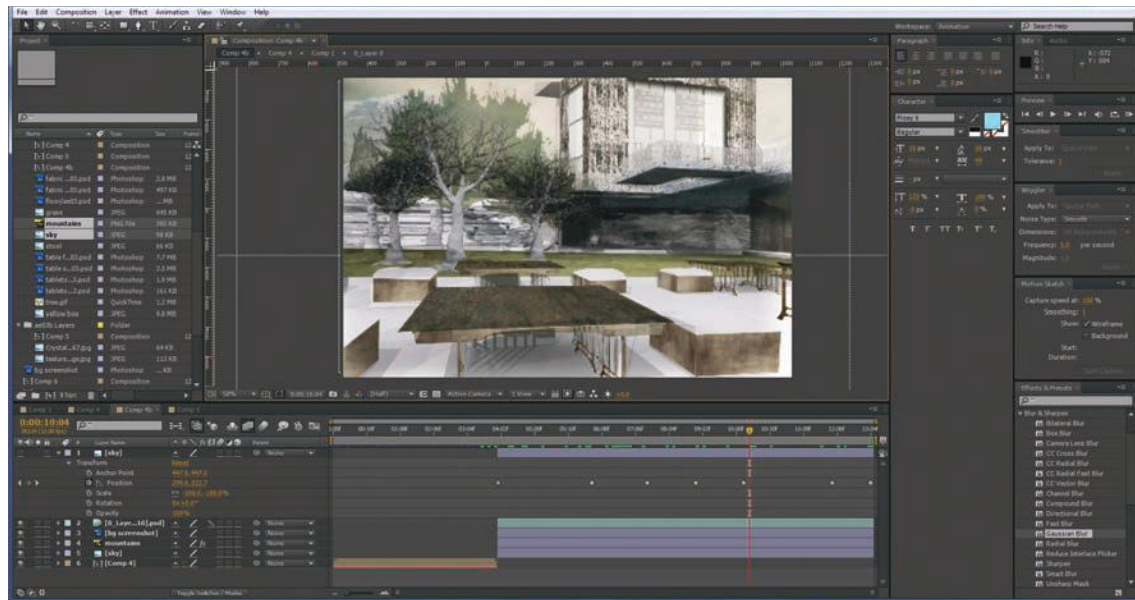
However, as seen in the screenshot below, the sequence layer begins at the last frame of the Composition 4b layer. A still image of the last frame is therefore necessary for the sequence layer to blend with.

This can be sourced by sliding the Current Time Indicator to the desired frame and clicking on the Composition tab and selecting Save Frame As>File from the drop-down menu.

The still was then imported into the project and placed in the current composition.



The parts of the still covering the sky were then masked out, and the layers for the sky and background mountains were placed in the composition and animated by keyframing their Position values.

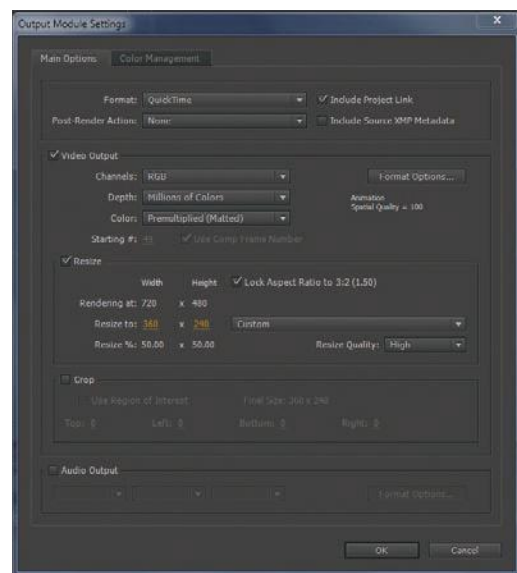
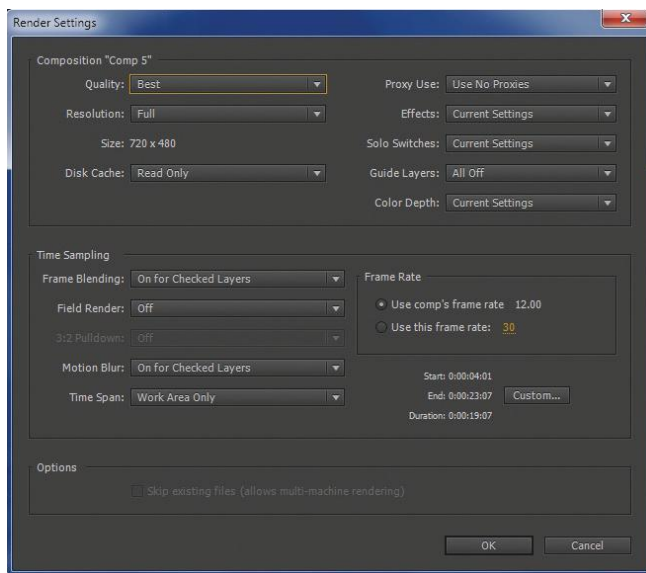


## 7: Rendering

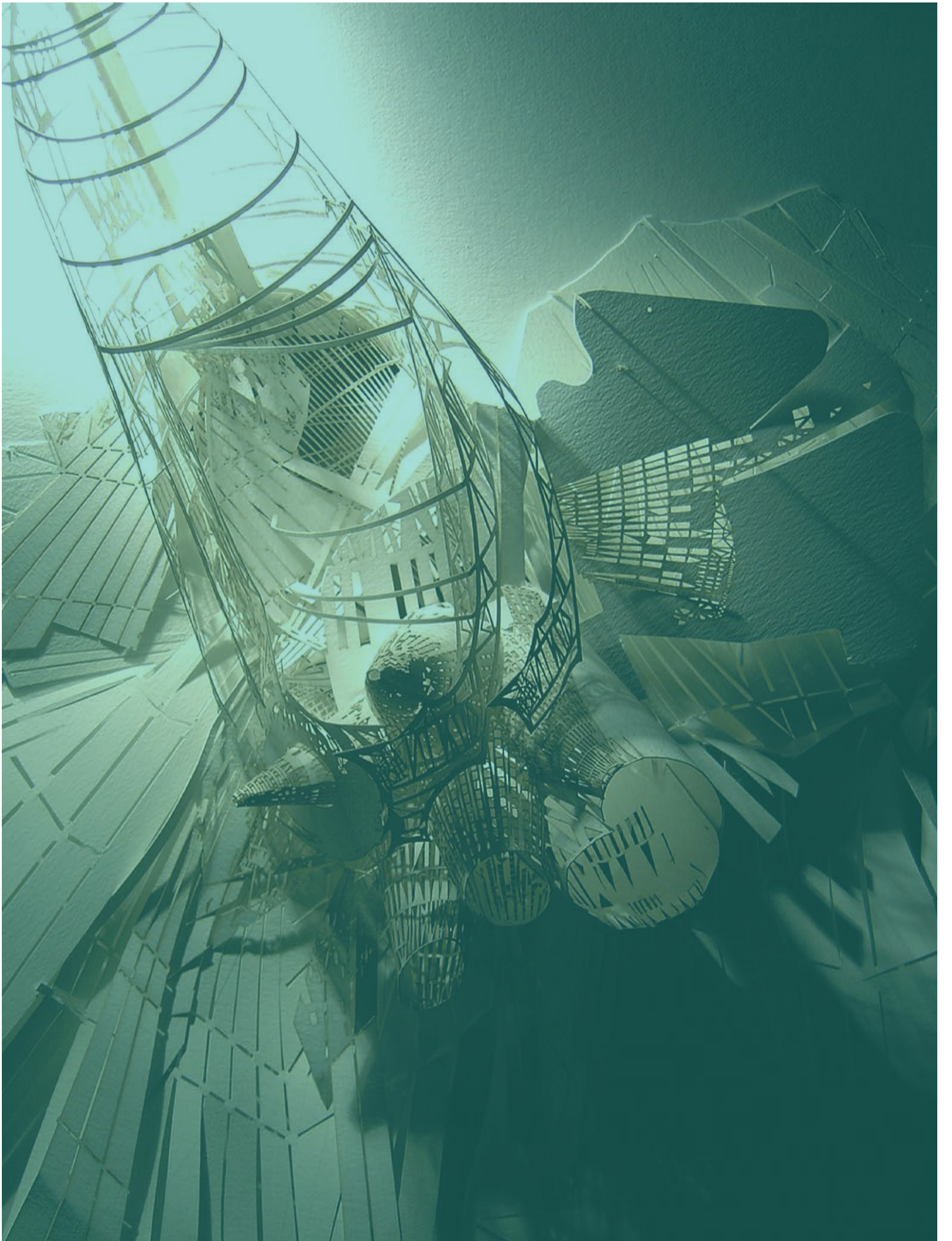
The final composition was then rendered by clicking on the Composition tab and selecting Add to Render Queue from the drop-down menu.

By clicking on the Render Settings option, it is possible to enter the desired Quality, Resolution and Frame Rate values of the rendered output.

Clicking on the Output Module option brings up the Output Module Settings dialogue box, where the format and size of the rendered output can be determined. After the appropriate values have been entered, the rendered output is created and saved by clicking the Render button.









# PLACES

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**170** INTERIORS

**176** LANDSCAPES

**188** URBAN SETTINGS

**Previous page**

Sara Shafiei (Saraben Studio). Magician's Theatre, National Botanical Gardens, Rome. Plan view of tracing paper and hand drawing. The design for a magician's theatre readdresses the sensuality and ornamental richness of the Italian baroque. Notions of magical illusion and geometric anamorphosis generate surgically constructed laser-cut drawings and models that describe the functional solution of the circulation, as well as the special complexity of this realm of projections, performances and illusions.

**TIP SPACE**

Concentrate on understanding interior space through light and material surface. This will lead on to textures and colour.

**Introduction**

This section brings together a range of drawing techniques and drawing types, all of which have been explored in earlier parts of the book. It arranges drawings into three clusters, according to the kinds of places they represent: interiors, landscapes and urban settings.

While acknowledging that this simple grouping is reductive, in the sense that it overlooks other kinds of drawings and places, it is nevertheless useful in terms of being able to establish a broad framework for the idea that architectural drawing is ultimately concerned with the creative exploration of a place and the communication of the qualities of that place. This section is about architectural drawings that represent a place where something happens, that has a physical presence, an orientation and a dialogue with its context.

In a sense, bringing together the variety of drawing techniques and drawing types in this way is an important counterpoint to seeing architectural drawing in terms of aesthetics alone. Unlike fine art, an architect's drawings have a necessary and often pragmatic purpose; they are grounded in the physical world, and are artefacts that construct a transition between the formal and the material imagination, and the eventual constructed place for human events.

An obvious consideration in the way we develop ideas for architecture is the physical and cultural context in which we are working; making images that are concerned with place distinguishes architectural drawings from those of the engineer – for the architect, the specificity of place matters.

Consequently, a great number of architectural drawings are concerned with physical context, and the parts of this section that deal with urban drawings and landscape drawings use computer-generated or physical models extensively to show how the proposed buildings relate to their surroundings.

It is more difficult to visualize how the building responds to a specific cultural context, but this is where architectural representation needs to look again at stage or film-set design, which often creates a world that reflects non-visible aspects of the narrative.

**Interiors**

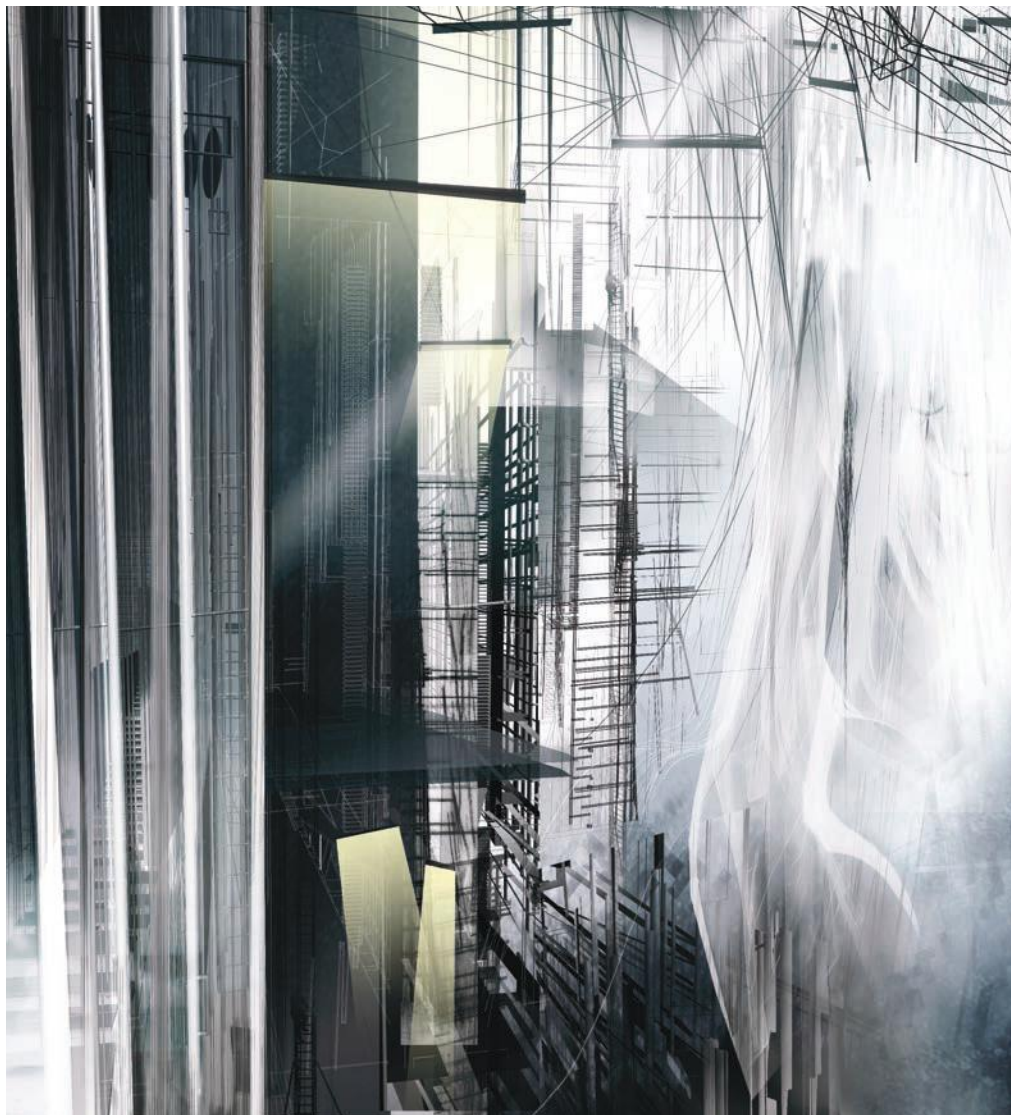
The interior is a significant genre in architectural representation. These drawings are distinct from the drawings of the architect-decorator, which have a different focus; drawings of architectural interiors tend to situate internal spaces as part of a sequence and aim to understand the building as a whole with respect to the urban/landscape context and its culture. Historically, drawings of interiors were not represented in terms of an independent aesthetic. Rather the architectural

interior was traditionally more like a canvas, a container for paintings, frescoes and hangings that represented a matrix of symbolic references, pointing to the physical and cultural context and its historical depth.

Such interiors are replete with distortions and multiple viewing angles and are almost collage-like in the manner in which they first hold and then open space, mediating between the symbolic interior and external landscape or city. Non-perspectival interiors emerge again in modern times most clearly with collages. As we have seen, the collage can be used to bring together more complex sets of relationships that may inform an interior. The work of the photographer Georges Rousse is relevant here. Rousse's final product is the photograph, but the interchange between interior/photograph and drawing is a creative journey that opens up unexpected relationships and challenges the dominance of our perspectival understanding of interior.

Like the etchings of Giovanni Battista Piranesi or the watercolours of Joseph Michael Gandy, Rousse's photographs reveal the deep significance of light in our representation of interiors. Visually, interior depth is represented in a drawing by increasing the darkness of the image as the space recedes. In working a drawing by hand, this structure tends to be established first, in mid tones. Without it, the more detailed elements of the drawing are more difficult to balance. Lights and darks are worked into and out of this basic structure.

The way light works in more detail in an interior is a complex phenomenon. By hand it is possible to swiftly establish a broad structure, but computer-rendering software can more quickly take the depiction of light towards photorealism, as radiosity algorithms now allow for multiple reflections of light off a room's surfaces. These packages can be useful both at the design development stage and as an illustrative device.

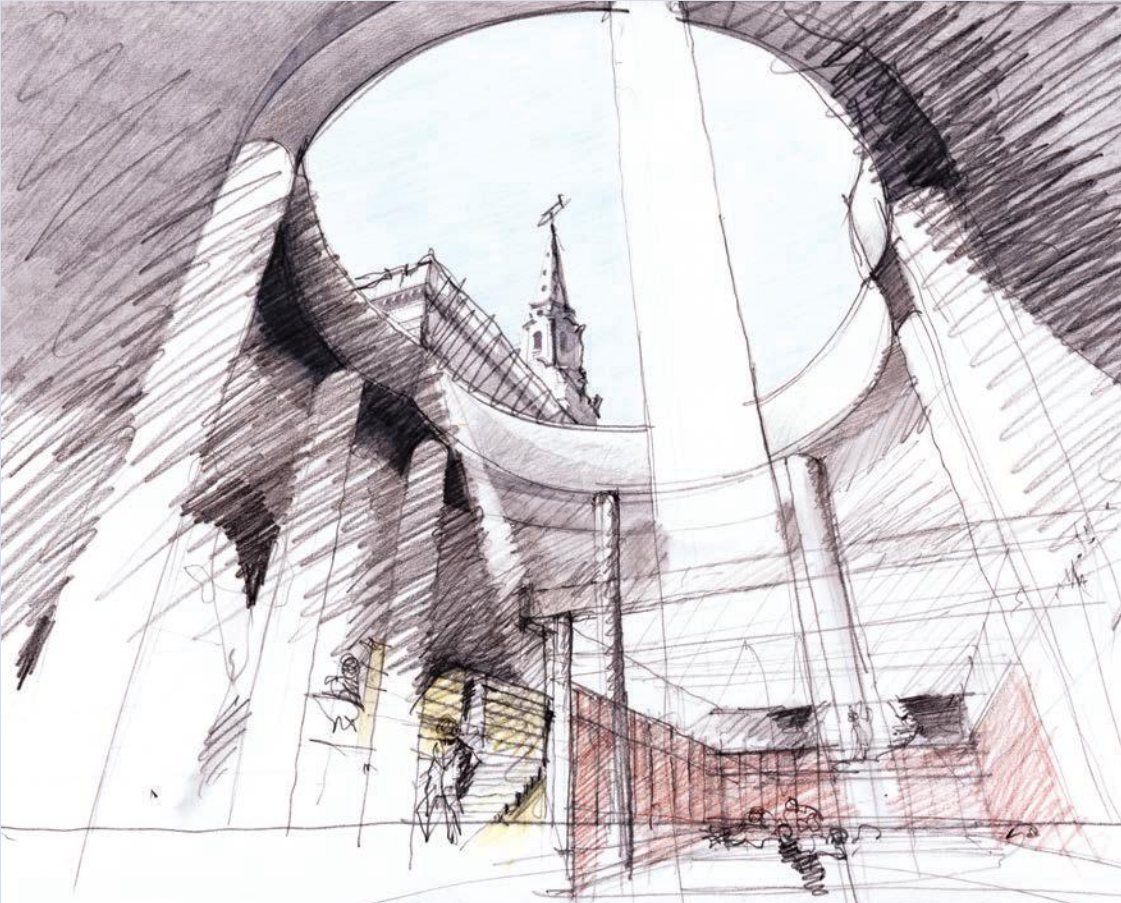


#### Left

Gillian Lambert's detail rendering of the House at Galleon's Reach is evocative of intermediate, partially enclosed space.



## Case Studies: Interiors

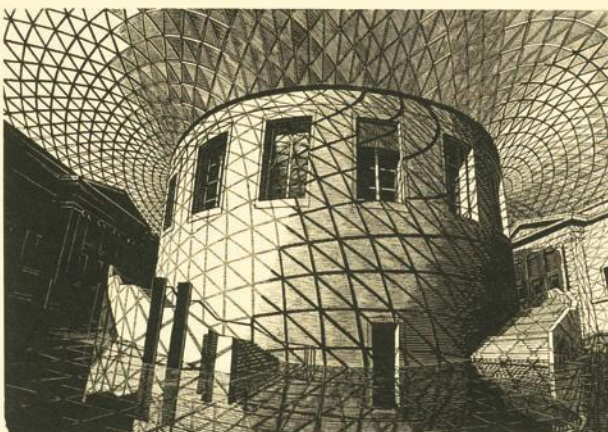


1

1. This is a preliminary pencil and crayon study by Eric Parry for the vestibule that gives access to the Crypt space of St Martin-in-the-Fields, London. Here the interior is understood as setting up a relationship with the church, the view to which provides an essential orientation during the journey to the underground space.



2a



2b



2c

This group of prints is a creative interpretation by the artist Anne Desmet of the Great Court at the British Museum and explores how light works in the space.

**2a. *British Museum Series No. 1*** is a wood engraving printed in black ink on Japanese Gampi Vellum off-white paper. This image was developed from photographs taken by the artist in daylight hours. The desired image was scaled up on a photocopier to the size of the end-grain boxwood engraving block and the outline structure traced from a mirror-image photocopy onto the block using a selection of fine engraving tools. In the cutting, the artist exaggerated various light effects observed in the building – in this instance, to suggest an idea of how the building might look at night with only one directed light source from one side – and also enhanced the intensity of the shadow fretwork cast onto the curving perimeter wall of the library by the lattice roof.

**2b. *British Museum Series No. 4*** is also a wood engraving printed in black ink on Japanese Gampi Vellum off-white paper. This image was a reworking of the engraved block for *British Museum Series No. 1* and there were a further two developments of this same block before the final stage was reached. The engraving already on the block was reworked and further engraved using a selection of fine engraving tools. In the cutting, the artist exaggerated various light effects observed in the building – in this instance, to suggest an idea of the silvery light of the building in bright daylight. She retained the area of deep shadow along the right-hand side of the curved library building to give a sense of the structure's three-dimensionality within the Great Court space.

**2c. *British Museum Diagonal Light*** is a wood engraving collaged on card. This collage was made by first printing an impression of *British Museum*

*Series No. 4* onto semi-transparent, buff-coloured, Japanese Kozu-shi paper. Once dry, the print was carefully measured into thin diagonal strips of equal width (each strip was only around 3–4 mm or  $\frac{1}{8}$  in wide), which were carefully cut out using a sharp scalpel and a steel rule – but leaving a very thin, uncut edge so that the print was sliced but still all in one piece. The image was then laid onto card and glued down, allowing a tiny gap to open up between each slice to suggest shafts of light slanting down across the building. To enhance this effect, a few of the print 'slices' were cut out completely, reversed and transposed from left to right to make use of the light effect generated by the paper being semi-transparent. This allowed the printed image to show through on the reverse side in a silver-grey tone, in contrast to the stronger black printing on the front. The idea was to experiment with some of the effects of Op Art and also to explore the strong sense of interrupted light within the Great Court.

## STEP BY STEP LIGHTING AN INTERIOR USING 3DS MAX AND V-RAY

This sequence by Ian Henderson illustrates the process of changing light effects in an interior image.



- 1 Main exterior light source. Set up a direct light to act as the sun and position to provide pleasing rays cast through exterior wall apertures. A direct light is used because rays cast from this light are parallel, thus best replicating the sun's rays and the formation of shadows cast.

Adjust the direct light's multiplier value to suit the scene.

Use V-Ray Shadows for cast shadow type.

Increase the Subdivs value under the V-Ray Shadow Parameters tab to improve the quality of the shadows cast and reduce noise.



- 2 Exterior ambient light. Additional lights are required to simulate ambient light entering the interior. Outside each wall aperture a V-Ray rectangular area light was placed. Physical dimensions of the light should be big enough to cover the extent of the aperture. Increase subdivisions of light to improve quality of shadows and reduce noise. Adjust multiplier value to suit.



- 3 Bounced light. To simulate bounced light, use global illumination. Adjust quality to suit scene and image size. Test using the different Irradiance Map presets, beginning with the lowest quality first.

First bounce was calculated using an Irradiance Map and was set to Medium.

Second bounce was calculated using Direct Computation.





- 4 Environmental light. To simulate additional daylight entering the space via the wall apertures, the V-Ray GI Environment and Reflection/Refraction Environment light was used to provide more ambient illumination. Adjust multiplier value to suit scene.



- 5 Interior lights. Interior artificial lights were added to illuminate specific areas of the scene. Standard spotlights were used with V-Ray shadows.



- 6 Additional lights are required to simulate ambient light entering the interior. To simulate additional daylight entering the space via the wall apertures the V-Ray GI Environment and Reflection/Refraction Environment light was used to provide more ambient illumination.
- Adjust multiplier value to suit scene.
- To simulate bounced light use global illumination.
- Adjust quality to suit scene and image size. Test using the different Irradiance map presets, beginning with the lowest quality first.

## Landscapes

This section covers drawings of architecture situated in natural landscapes, architecture intrinsically tied to the land or the gardens it frames. These relationships, once the subject of great paintings, frescoes and tapestries, continue to inspire architectural strategy and detail. Large-scale topographical plans, sections and models of landscapes are among the drawings that situate building proposals.

Representation of landscape is itself a major area of study for contemporary visual artists, and architects can certainly draw on the wealth of these studies. At the same time, the focus of the architect's drawing is often not the landscape itself, but rather a reiteration of an age-old dialogue between nature and artifice: constructed landscape, rather than the landscape as a whole.

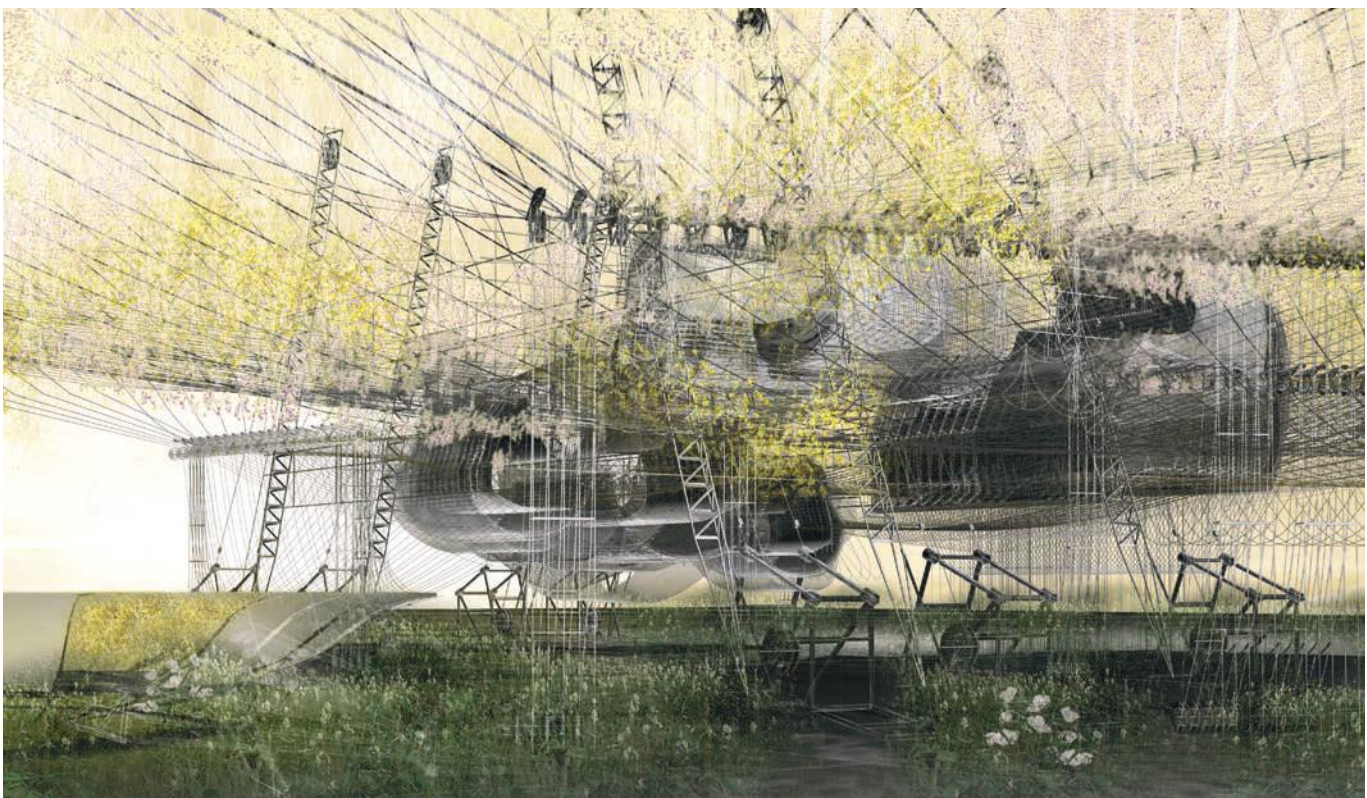
It is interesting to note how layering of colours is part of the technique traditionally used to depict landscapes. As far back as the tempera paintings of the Middle Ages and early Renaissance, for instance, we find woods (nature) were first painted with several layers of black, and then over-painted with thin glazes of the transparent pigment Terre Verde (Earth Green). Perhaps this gaze into deep shadows, representing the mystery of the natural landscape, is echoed in the layered glazed surfaces of oil and watercolour seen in the later great paintings.

### Below

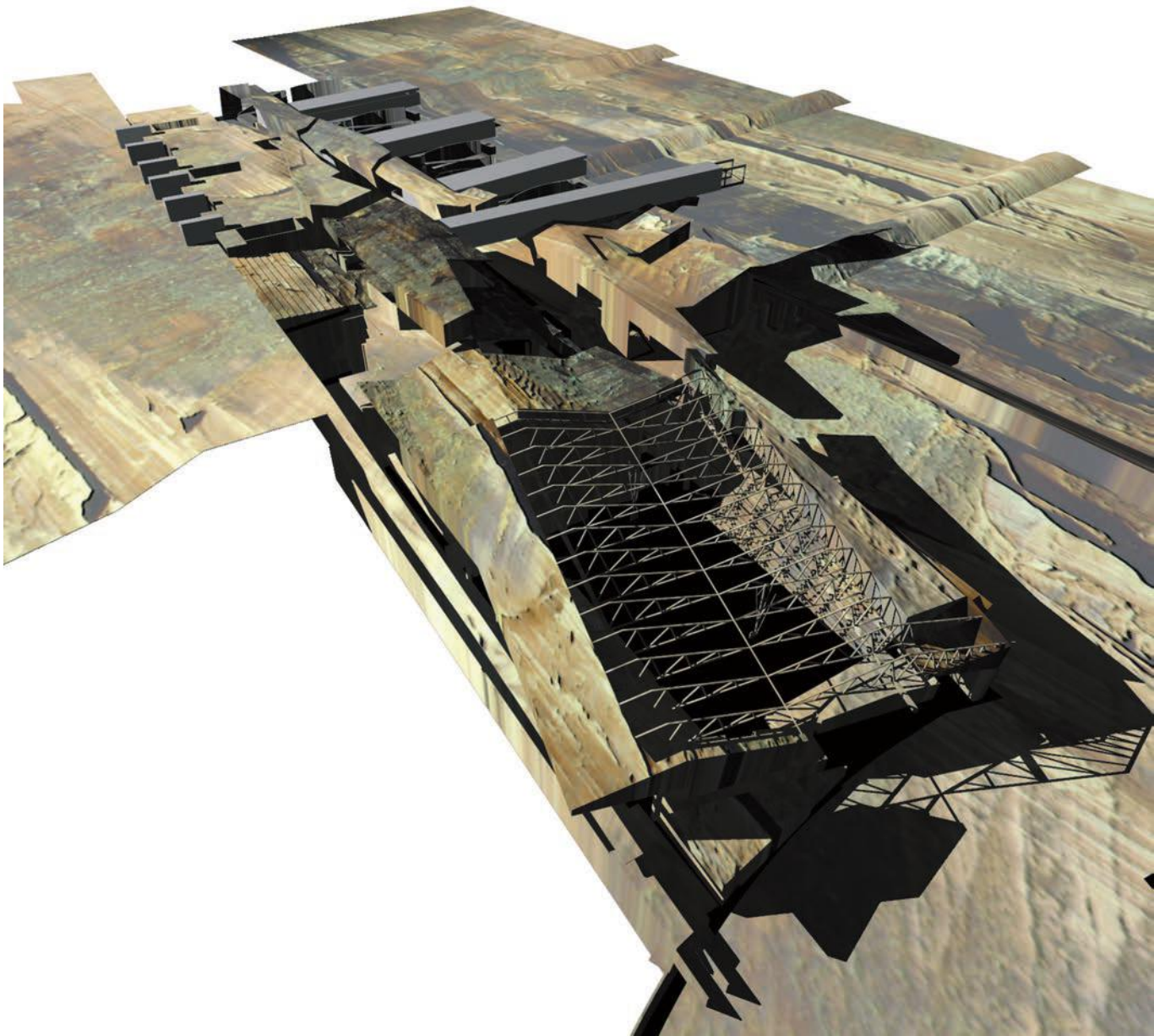
A carefully judged 'digital render' by A.E. Lee. The ambiguity of this constructed landscape is achieved by balancing render settings of the original model and layering other effects in Photoshop.

### Right

This carefully rendered digital drawing by Morphosis represents the structure in its landscape setting, creating the impression of real engagement with the terrain that is important to many architectural proposals.

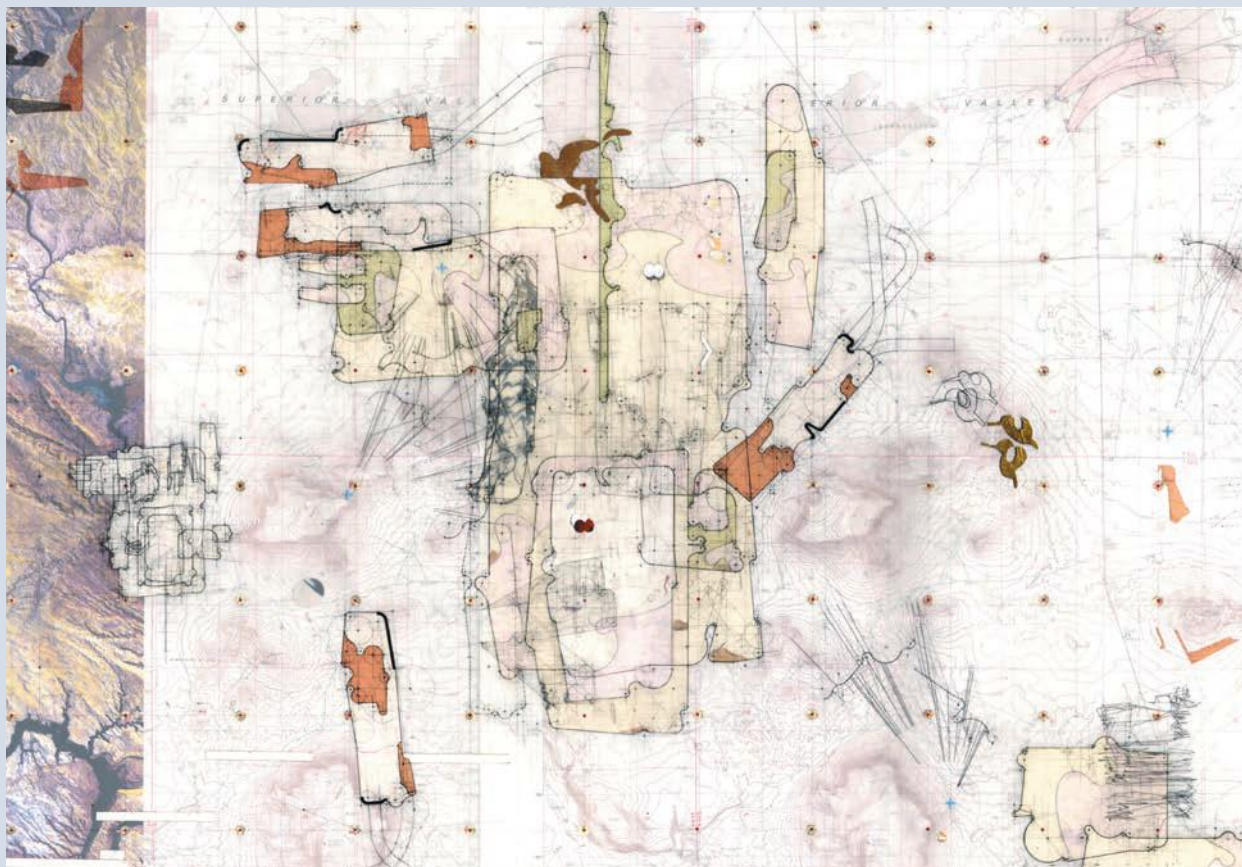








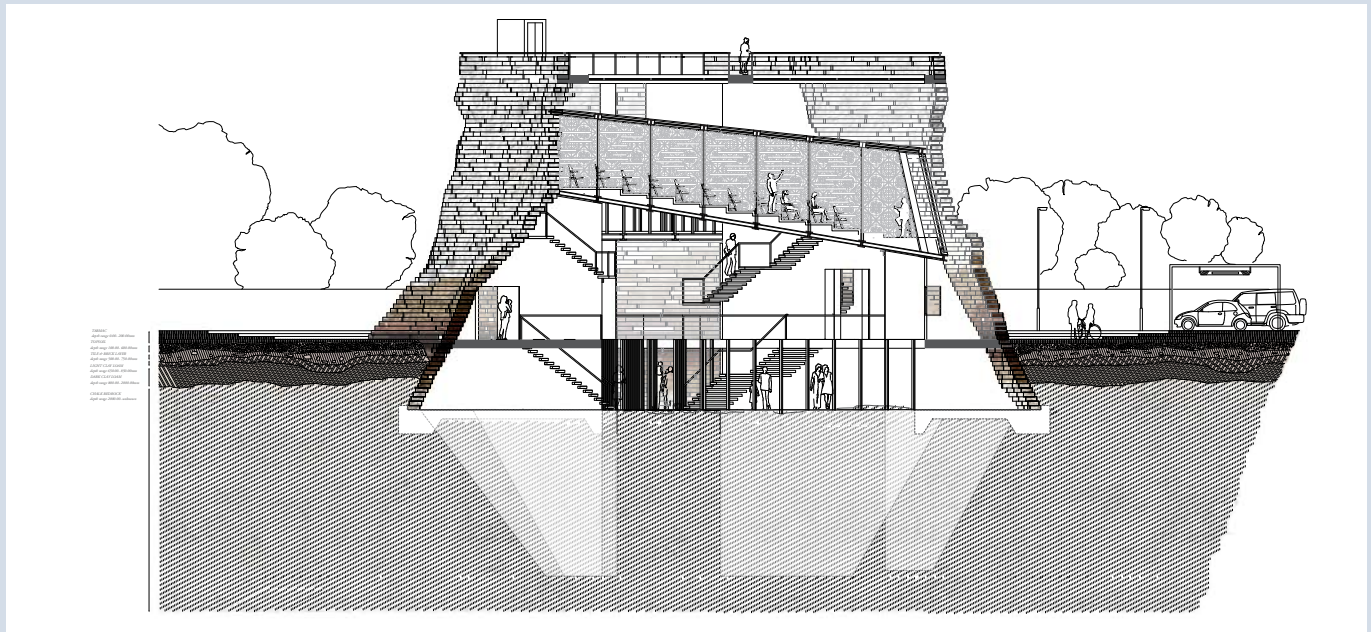
## Case Studies: Landscapes



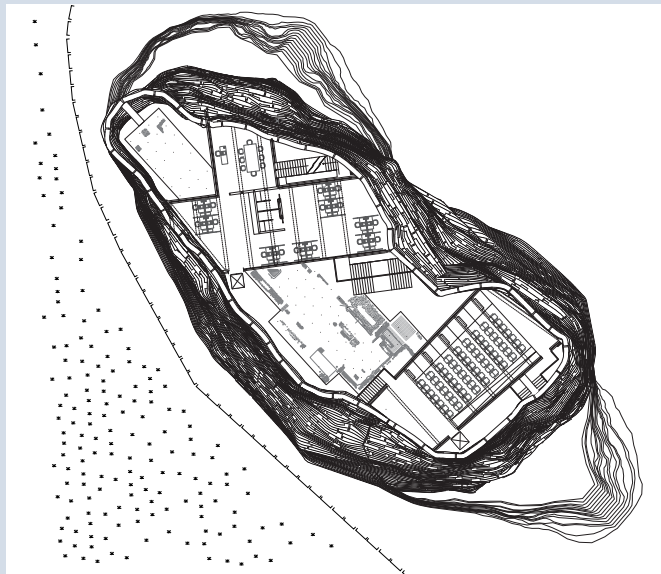
1

1. Perry Kulper's drawing is a particularly rich exploration of landscape at a strategic level. The contoured topography gives rise to a poetic interpretation that appears to be part landscape and part emerging construct. The drawing overlays the plan of the real landscape with a delicate, layered set of lines and tones. This image operates at two levels: first, there is an overall arrangement of boundaries and surfaces, drawn in dark pencil on mylar (film) and potential enclosures are emphasized in Naples

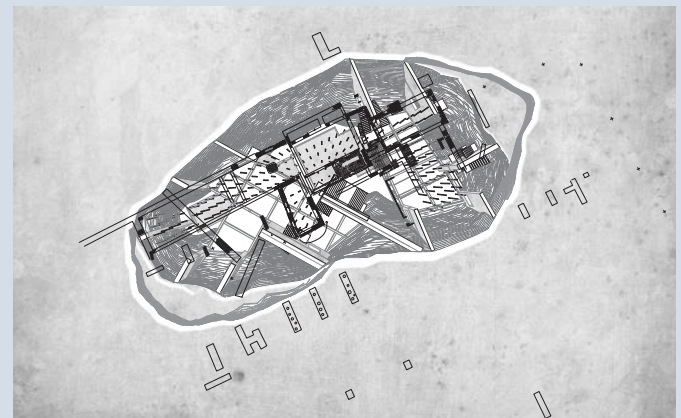
Yellow, pinks and Sienna Earth; second, there is an intricate world of detail that negotiates boundaries between the constructed and the explicit landscape, visible through the translucent surface of the mylar. The layering of the drawing in this way expresses a depth of landscape and at the same time presents the image as a vehicle for imaginative interpretation. This kind of drawing is only in part a conveyor of information; it is also a drawing that provokes reflection about landscape and architecture.



2a



2b



2c

2. In this sequence of plans and sections, Sophia Cole describes a project for a municipal archive in Princes Risborough, UK (see also pages 104 and 122). The 'forgotten history' of this small town is evident on the site of The Mount, beneath which is buried the ruins of a medieval manor built for the Black Prince in 1344. The proposal references the original manor with spaces that link past and present volumes within the typology of a town hall.

The drawings above describe a concept for the material and architectural expression of this new civic landmark, and derive from the process of

archaeological digs. The underlying geologies of clays and chalk that have been removed through the careful excavation of the manor house are utilized in the material composition of the internal structural elements and the façade. The extrusion of the footprint of the old manor house and the inversion and abstraction of the excavated area create the form and skin of the building. The spaces within the building have been developed using parameters set from existing excavation scars in the landscape.

2a, short section: The section cuts through the geological build-up of the earth surrounding the

building and, within the building, the archive and sculpture levels and the Council Chamber/Auditorium. 2b, upper floor plan: The upper floor plan shows the Council Chamber/Auditorium and council offices, which are suspended within the void of the building. 2c, Worm's-eye view: The drawing is a wide-angle view taken 20 metres below basement level, looking up into the building.



3

3. Stephenson Bell's rendering of their proposal for a visitor and education centre at the Messel Pit, near Frankfurt (a UNESCO World Heritage Site), is equally evocative, and maintains a high level of detail and clarity. As part of the development of the scheme, the architects visited the site and undertook a photographic study with a Canon 350D digital camera. The muted palette of the snow-covered landscape was emphasized by converting the images into black and white, with the contrast and brightness adjusted (so that all the images were consistent). They were then 'stitched' together with Photoshop to create a continuous background for the computer render of the proposed building. The background images were faded out at the perimeters to blend in with the sky and ground.

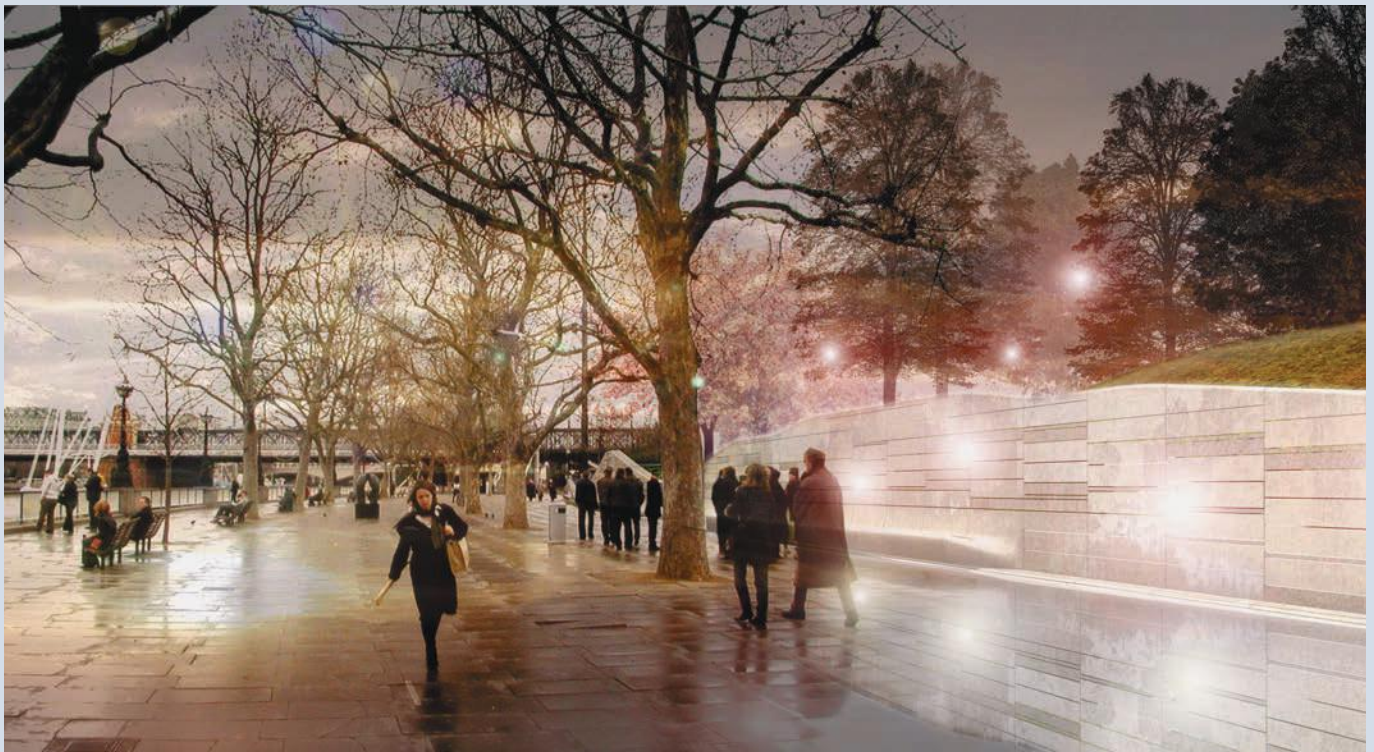
The proposal was modelled with 3ds Max and rendered with V-Ray, with the camera angles being set up early to enable the

background and foreground to be developed while the model was being created. Textures were taken from existing elements on the site photographs (which were adjusted in Photoshop to avoid any repetitive tiling). Particular attention was given to the lighting to achieve a soft diffuse light, replicating the winter haze apparent in the site photographs. The ground levels were modelled to form the right shadows when the ground falls away from the projecting walkway, and together with the soft light the appropriate shadows were created.





4a

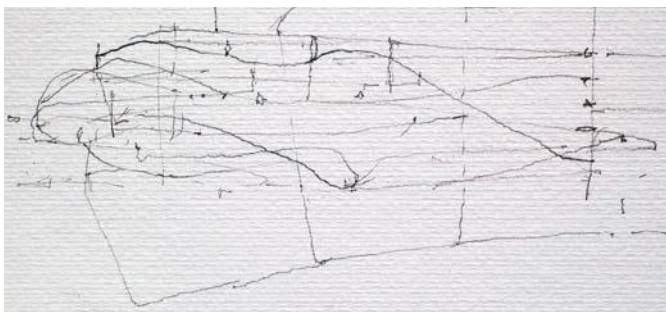


4b

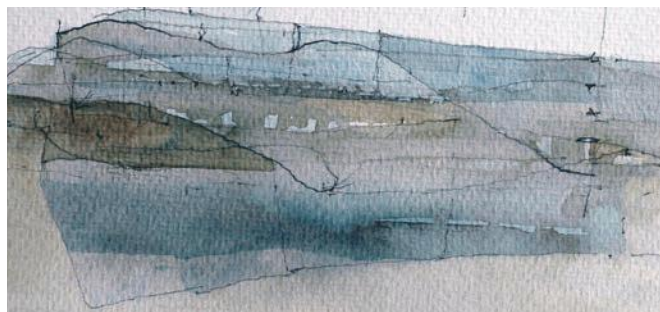
4a, b. The view of Queen's Walk, London (in winter), by West 8 has a similar delicacy in the way that the landscape is rendered. The image combines clarity with a visual impression of

the character of the landscape proposal. By contrast there is a more diagrammatic feel to the isometric view (at night) of the overall proposal.

## STEP BY STEP DIGITAL PAINTING LANDSCAPE IN WATERCOLOUR AND PHOTOSHOP



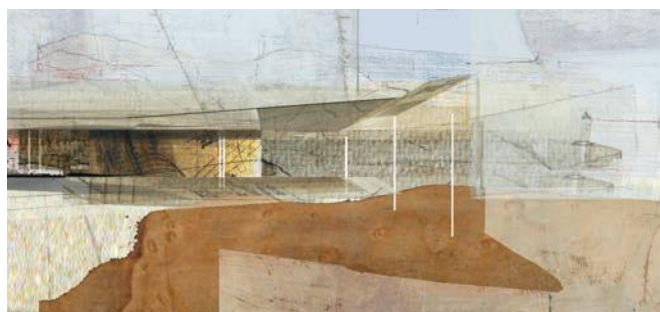
**1** This exploratory sketch is based on a landscape study at the early stages of the design process, where the medium of watercolour is a means of thinking through preliminary ideas of location and a response to the flatness and scale of the context. An abstract pencil sketch is not intended to be representative of the specific landscape, but instead fixes certain ideas about measurements and scale.



**2** The first washes overlay Burnt Sienna and Raw Umber (natural) onto Payne's Grey to represent a sense of the landscape setting. The washes are loose and are used to find possible ideas for the eventual structure.



**3** Importing the watercolour sketch into Photoshop, a foreground texture is added in a new layer and trimmed using the Pen tool. Some of the washes are lightened by wetting the page and then reducing the colour with a sponge.



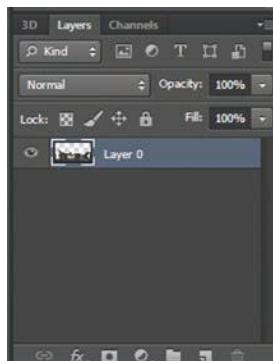
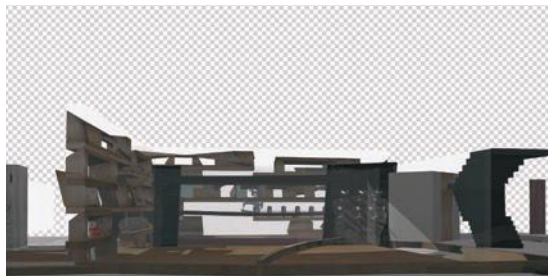
**4** Photoshop is used to complete the sketch image for the new structure in the landscape.



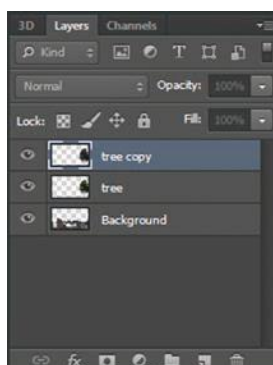
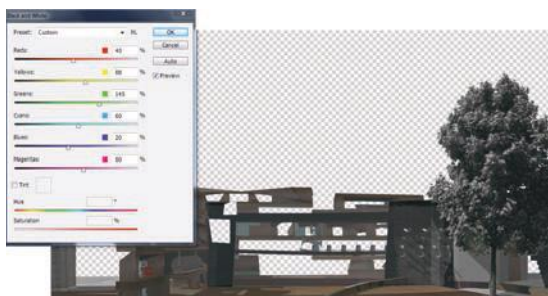
# STEP BY STEP CREATING AN EXTERIOR SCENE IN PHOTOSHOP

In the following sequence, architect Maria Vasdeki illustrates an effective way of building an exterior scene in Photoshop from a basic CAD-rendered output. The final render focuses on the external landscape that the building creates, rather than the building alone. The drawing is intended to explore

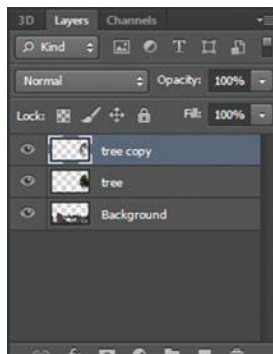
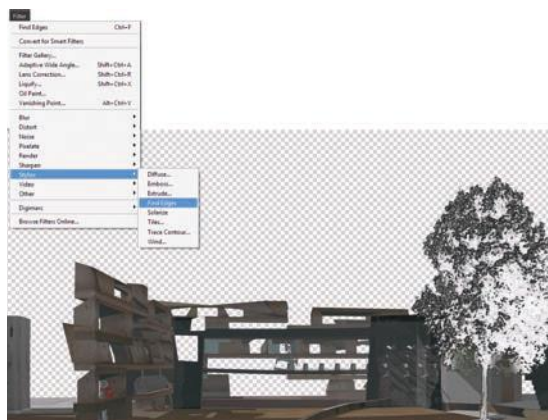
the character and scale of the landscape, and set up the conditions for further development and resolution. For these purposes detailed articulation is less important than a sense of light, orientation, scale and material quality.



- 1 A very basic render is brought into Photoshop. The unwanted background is selected and removed with the Magic Wand tool.

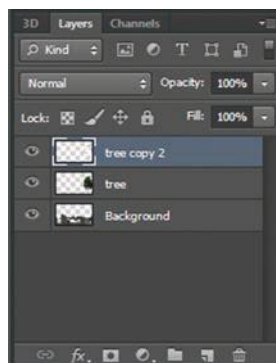
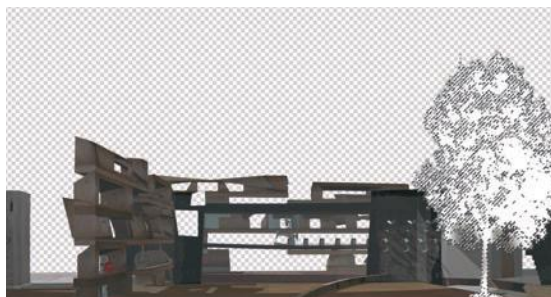


- 2 Having placed an image of a tree in the file, and removed unwanted areas using the Lasso and Magic Wand tools, the tree layer is then duplicated and desaturated via Image>Adjustments>Black & White.

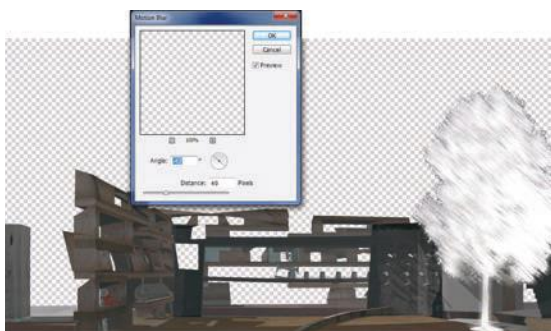


- 3 The Find Edges filter is applied to the layer, Filters>Stylize>Find Edges.





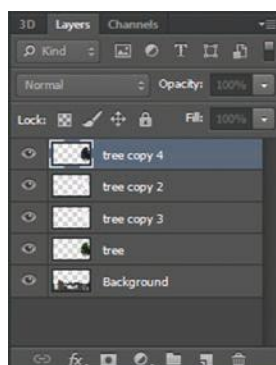
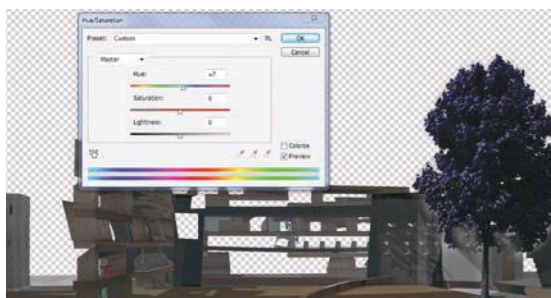
4 The grey areas are selected using the Magic Wand tool, and filled with white using the Paintbucket.



5 The layer is duplicated and a Motion Blur filter applied, Filters>Blur>Motion Blur.

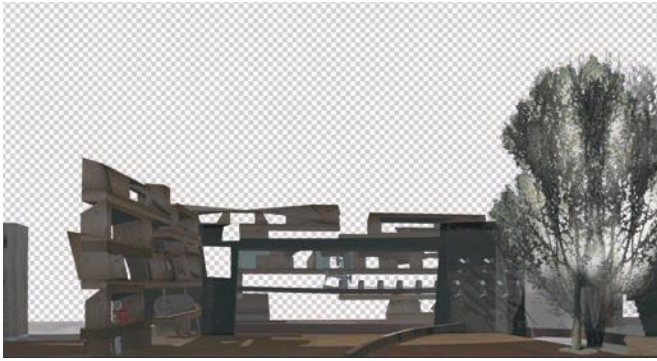


6 The white layer's Blending Mode is set to Multiply and the blurred copy's Blending Mode is set to Hard Light. Their order is then swapped, placing the blurred copy between the white layer and the original tree layer.



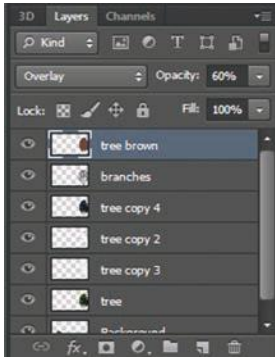
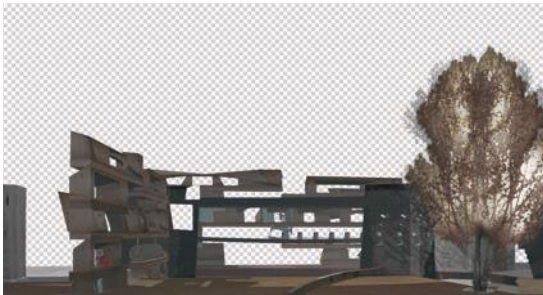
7 Another copy of the original tree layer is made, then placed on top of all other layers. Its Saturation and Hue values are then adjusted (Image>Adjustments>Hue/Saturation).

This layer's Blending Mode is set to Exclusion.

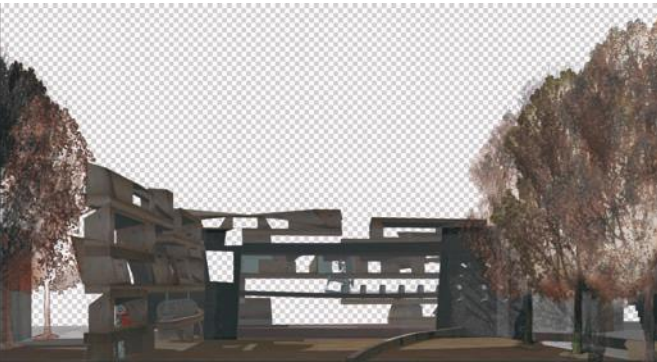


8 An image of tree branches is brought into the file. The semi-transparent parts result from using the Eraser tool with lowered Opacity and Flow values. The Opacity of the branches layer is lowered to 60%.

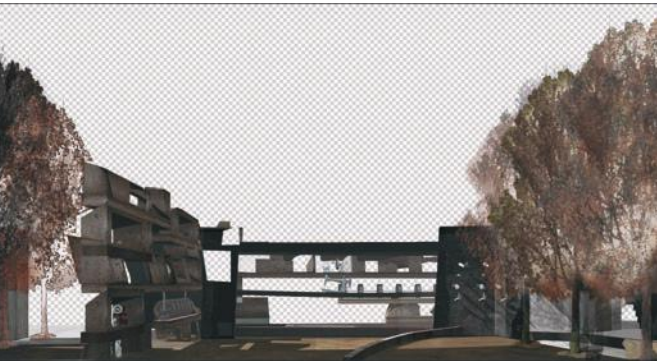
All steps so far will help add some depth to the final tree composition.



9 A brown tree-shaped vector is created, its Blending Mode set to Overlay and its Opacity lowered to 60%.

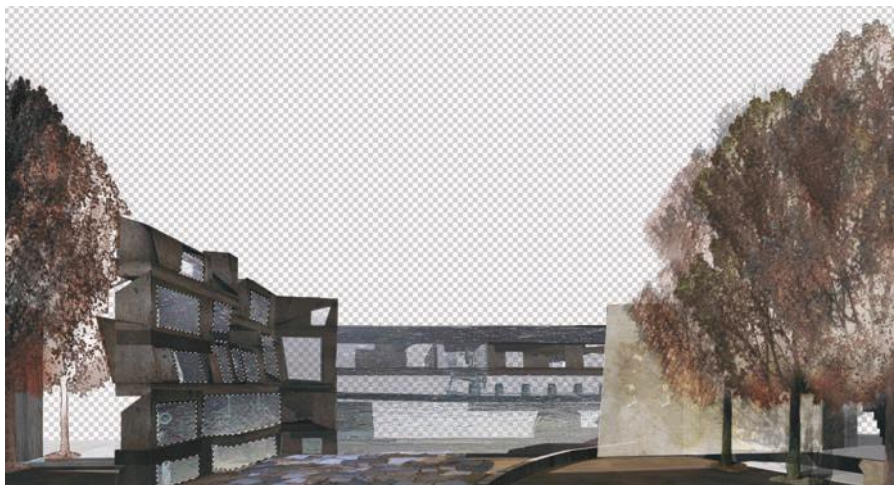


10 All other trees are created following the same steps, with slight variations in the Hue/Saturation values.

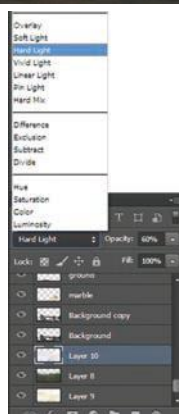


11 The background layer is then duplicated and desaturated. Its Fill is set to 60% and its Blending Mode set to Overlay.

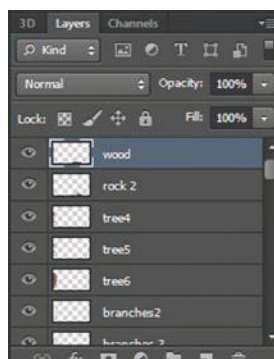




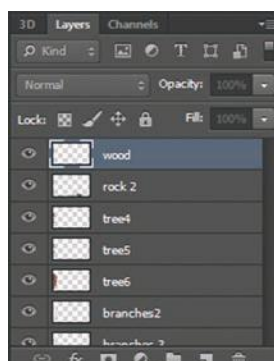
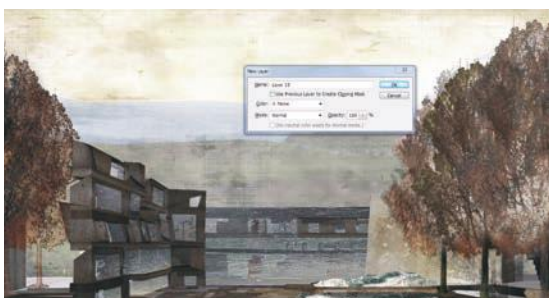
- 12 Textures are placed in the file and cut into the appropriate shapes to act as materials. All the new layers have lowered Fill values but their Blending Modes are set to Normal.



- 13 The background hill is added and then a yellow texture for the sky. The yellow texture's Blending Mode is set to Hard Light and its Opacity to 60%.

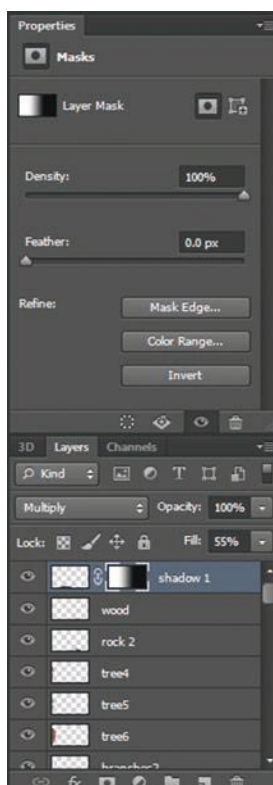


- 14 After adding the rock and its reflection, a wooden bench is created using an appropriate texture. The layer is given the necessary perspectival distortion via Edit>Transform>Distort.

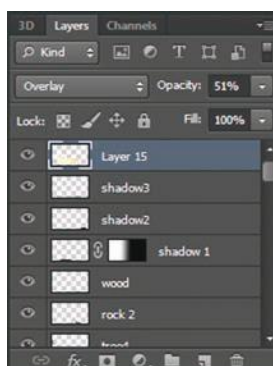


- 15 The shadows are now created. For example, the shadow on the floor is created in a new empty layer by selecting the appropriate areas and filling them with black using the Paintbucket.





16 The Blending Mode is set to Multiply and the Fill set to 55%. A mask is created by clicking the Mask button at the bottom of the Layers panel. With the Gradient tool selected and its fill set to From Foreground to Background, a linear gradient is applied on the mask.



17 The sky layer is duplicated and brought on top of all other layers. Using the Lasso tool and the Layer via Cut option from the Layer tab, the sky layer is cut into two separate layers, one in the shape of the original render layer and the other covering everything else in the composition.

The former's Opacity is set to 51% and the latter's to 23%, with both layers' Blending Modes set to Overlay.



18 The final composition.





## Urban settings

Urban situations produce a wealth of diverse architectural drawings, varying in scale from strategic studies of a city, its metabolism, topography and culture, to relational studies of more immediate context – the block or the street – and finally through to specific spatial studies that negotiate boundaries, transitions, structure and materiality.

The range and complexity of issues is matched by the diversity of ‘urban drawing types’ and approaches to design in urban contexts. During the process of urban design, drawings are the vital component in terms of the way they can open up the debate and engage others. ‘Urban drawings’ are key drivers for the design team, in the eventual resolution of the city’s often-conflicting demands. The role of the urban drawing is two-fold: first, to synthesize; second, to communicate.

Urban drawings incorporate wide-ranging specialist inputs and bring together the perspectives of diverse stakeholders. While software can facilitate information management, these complex design decisions still require judgment based on a deep understanding of the city and, like any other architectural situation, will need to be worked out through drawings, models and artefacts at a range of scales.

One of the dominant kinds of urban drawings today is the perspective, and computer-generated modelling enables building forms to be placed in context with photographic precision. With perspective comes the ability to see the city as a unified scene and also to demonstrate explicit formal relationships. The computer facilitates the ‘designing’ of the city and allows it to be visualized in three dimensions.

At the same time, however, the expectation of these photorealistic images should not preclude other, perhaps more subtle, studies that foreground less tangible aspects of urban life – drawings that capture, for instance, the performance, metabolism and life of the city.

### Left

*Matera towards Evening*, a linocut by the artist Anne Desmet, is about simple observation of the city and light. Printed in blue-black and cream inks on Somerset Satin paper, it is a direct development of a small, detailed, pencil and grey wash drawing (made on site) of part of the ancient town of Matera, in southern Italy. The sun is just hitting the scene and the drawing emphasizes the way that buildings merge into the shadows, the rocks from which they came. Two printing blocks were used: the key block, printed in blue-black, carried all the structure of the composition; the second block (the same size as the first) was uncut, but inked in a transparent cream tone over the first printing in order to imbue the image with a sense of the yellow warmth of the stone and sunlight in contrast to the bright whiteness of the printing paper.

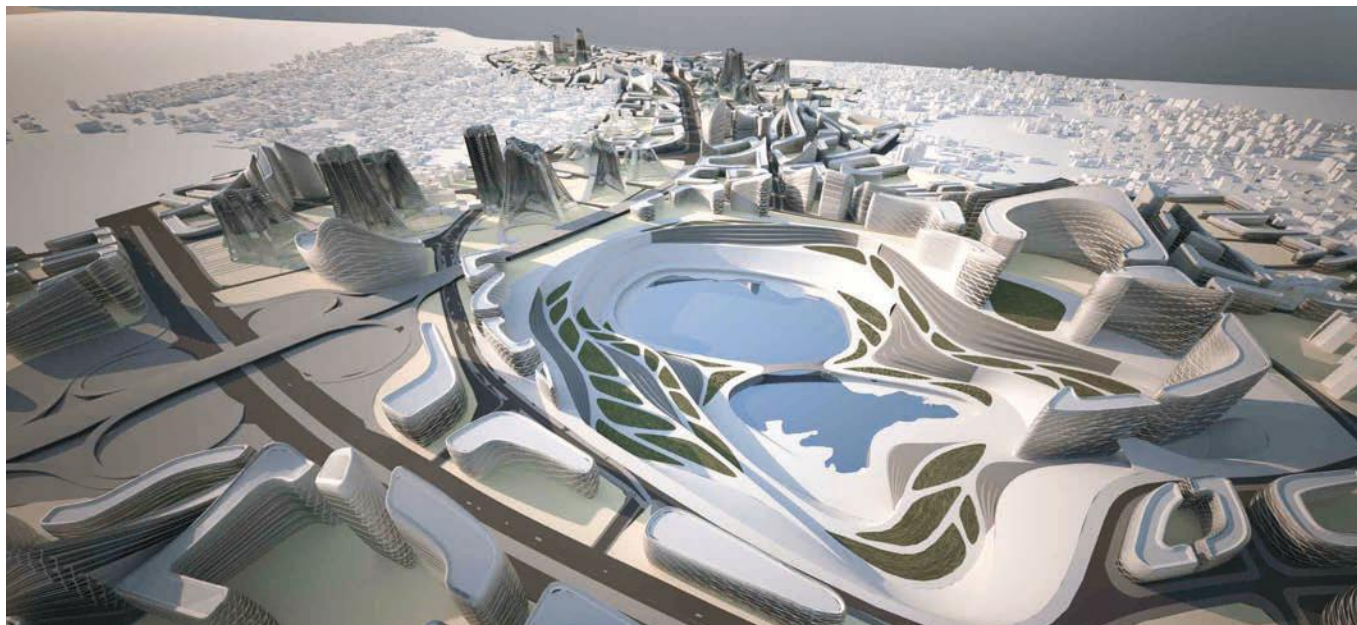


**TIP OBSERVATION**

Use drawings and other media over a period of time to develop an understanding of changing conditions and different patterns of inhabitation.

**TIP CONTEXT**

In drawings that show context for a specific building, concentrate on careful observation, measurement and visualization of the immediate surroundings. Detail seen from a further distance matters less.

**Above and right**

Zaha Hadid Architects, Kartal-Pendik masterplan, Istanbul (see also pages 111 and 126). This project began by weaving in and out of the existing fabric to create a soft grid that forms the generating plan for a three-dimensional developmental framework (right). Topologies

were developed through scripting software that responded to the perceived demands of different districts. The masterplan image (above) was made by taking this adaptable model and rendering it using a range of software including Rhino, Autodesk and Maya.





## Case Studies: Urban settings

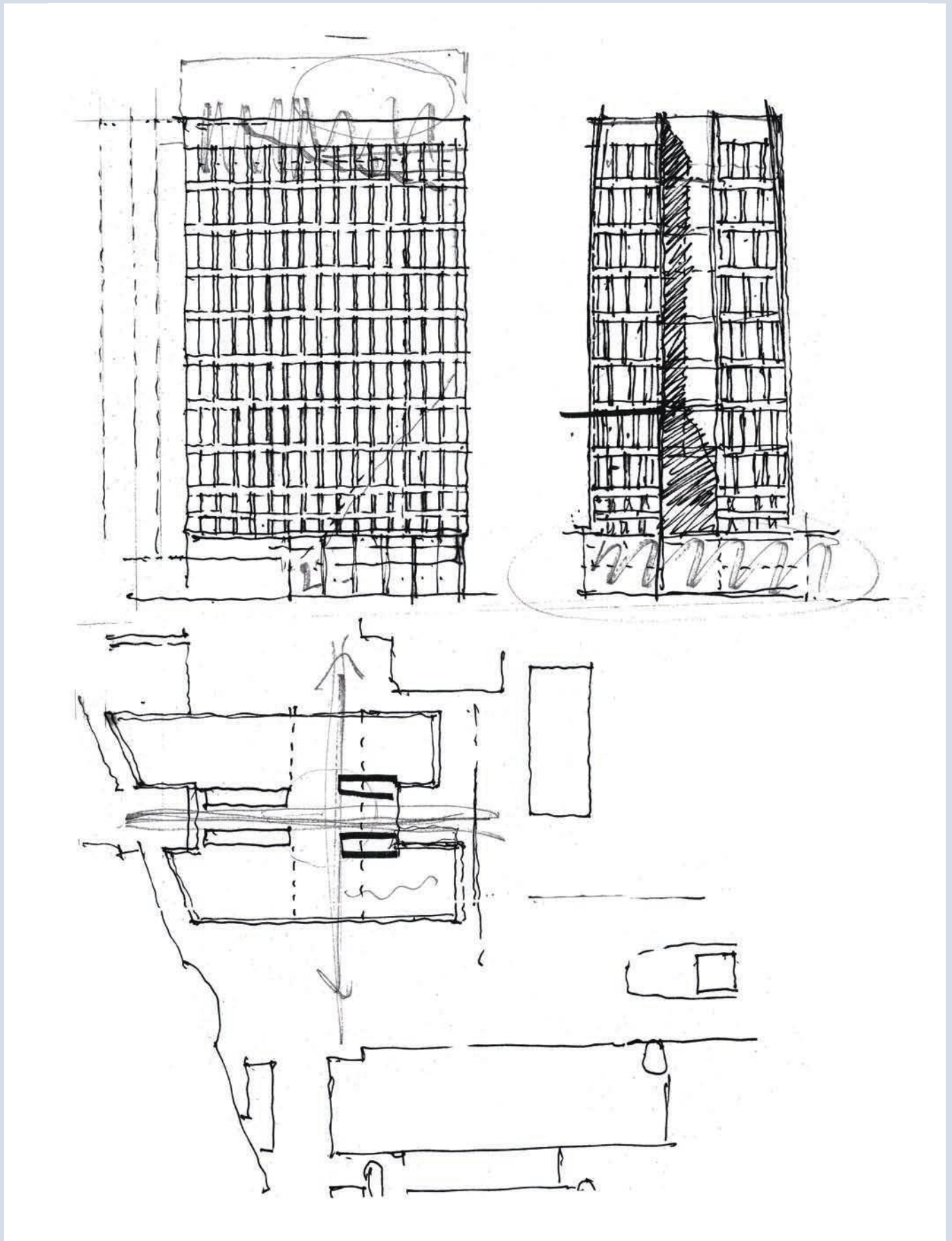


### TIP URBAN SPACE

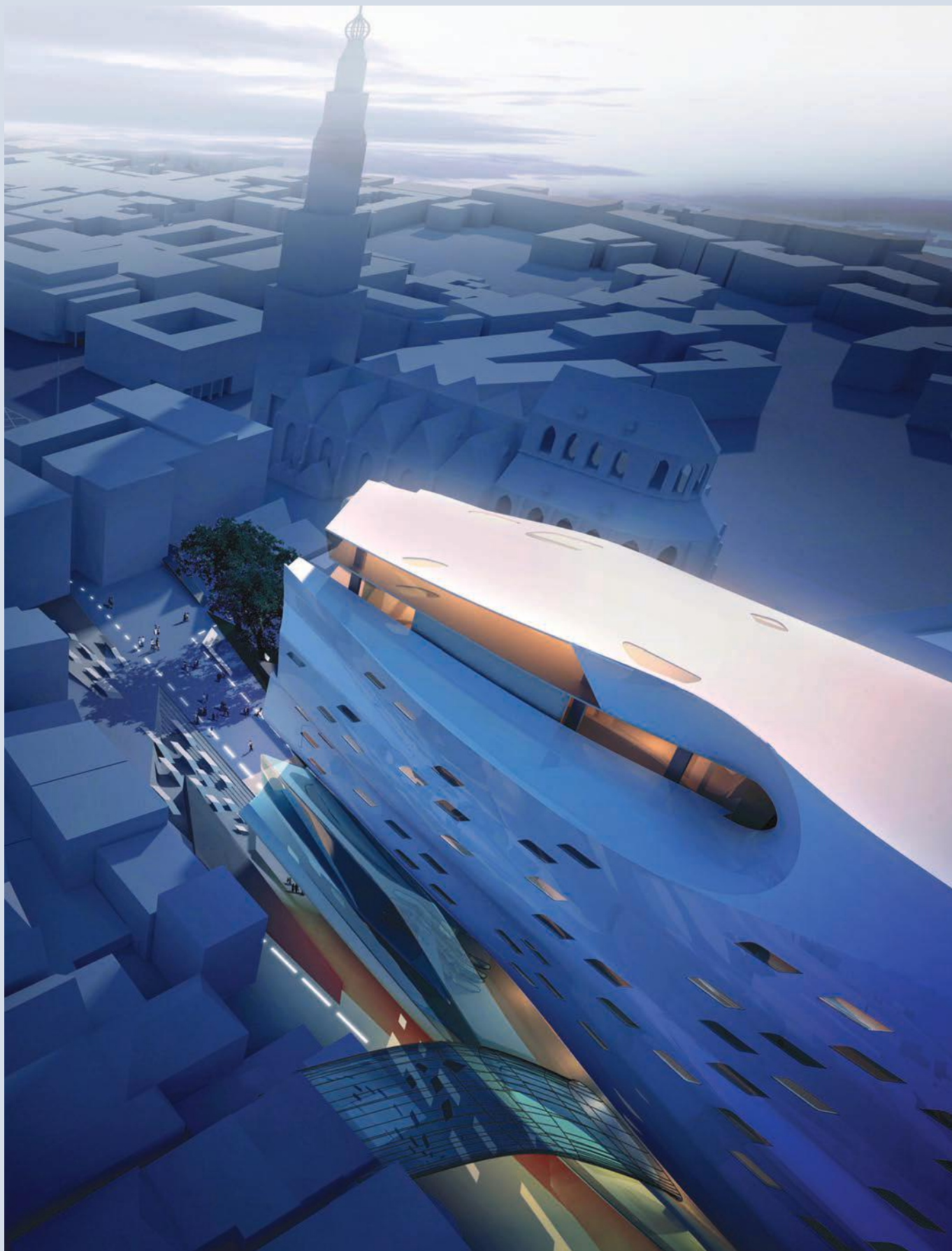
Use plans, sections and models to understand three-dimensional patterns of urban space.

1. This rendered CAD model, seen at the right of the image, was made as part of the design process for the Lausanne Opera House by Devanthery & Lamunière to show the proposed building in its urban context.

2. It is interesting how the hand-drawn sketch still remains a key tool with which to synthesize and articulate ideas, even in the complex environment of the contemporary city. This study by Eric Parry shows an urban plan and two elevations for 5 Aldermanbury Square in London. The pencil sketch establishes, at an early stage, preliminary ideas of strategic importance to the development – in plan, the idea of a generous public space linking urban spaces to either side of the building at ground floor. The scale of this is indicated in the base of the first elevation. On the second elevation another idea – the inward canting of the upper parts of the elevations which is key to the final project – first appears. This device reduces the impression of the scale of the building at street level. In this sense this simple sketch is a synthesis of ideas about the life and experience of the city with strategic and detailed decisions about form, arrangement and structure.











4

3. Zaha Hadid Architects, CAD image of the Groninger Forum, showing the proposed building in the context of the existing fabric. The effectiveness of the drawing is partly in the way it limits the use of colour to highlight the proposal. The rest of the city is rendered in a blue/grey tone and, while giving the background context, it does not detract from the dramatic building that appears as a light plane cutting diagonally across the image from the bottom right. This composition and carefully judged play of light and movement are key to the power of the drawing.

4. This soaring project for 'A Caravan Park in an Urban Environment' (the refurbishment of Centre Point, London) by Yakim Milev was interrogated via readings of a temporary, rentable space through the prism of a kinetic network of self-assembling parts. The building is an adaptive system of platforms, which create a network based on the preferences of the people that occupy it. This idea is brilliantly

captured in the upward gaze of the exaggerated perspective, rising through its urban context. The image combines a detail wireframe model with rendering and overlays to create the impression of change and movement. Starting with the structural hierarchy of the existing building, the internal, shifting, spatial definition was developed through scripting in Grasshopper. The final image was completed in Photoshop.

# STEP BY STEP CREATING A PHOTOMONTAGE

In this sequence of images by Ian Henderson a photograph of an existing urban environment is manipulated to show how a proposed architectural intervention would look on the site.



- 1 Photo. Refine the photograph for best results with colour-correction techniques using layer or image adjustments such as Levels, Curves, Photo Filter, Hue/Saturation and so on. Make sure that any unwanted marks and dust spots are removed using the Clone Stamp and Heal Brush tools. Sharpen if necessary, using either the Unsharp Mask or Smart Sharpen filters.



- 2 Model. Create a new group and rename. Drag the CG element into the new group in the working document with the Move tool, holding down Shift so that it lands in the correct location.

Rename the new layer with the CG element. Select the group and apply a layer mask. Using the Brush tool, paint on the layer mask with black and white to hide and reveal appropriate parts of the building layer so that it sits well in the photograph.

The CG element was colour-corrected to match the tonal values of the photograph using layer or image adjustments such as Levels, Curves, Photo Filter and Hue/Saturation.



- 3 Background. Work on the background to mask out any unwanted areas of the photograph. Add trees and bushes to the background using groups, layers and layer masks. Create a new layer and clone areas of the sky to cover up the existing building. To blend the new CG road with the existing road, copy and clone areas of the existing road onto a new layer until the two elements join correctly.



- 4 Shadows. To make sure the CG element sits properly in the photograph, trace the shadows cast by the existing buildings using the Quick Mask mode to paint and create a selection. With the existing shadows traced and selected, create a new layer and rename. Fill the selected area with black using the Paint Bucket tool. Set the opacity of the Shadow layer to match the value of the existing shadows.





- 5** Reflections. Create a new group and rename it. With the Polygon Lasso tool, select the windows. Create a layer mask for the group from the selection. Drag, drop, scale and position images that closely represent what could be reflected in the glass into the new group. Ideally use photographs taken from the other side of the road to provide an accurate reflection; this will require careful planning in advance. Colour-correct the reflection images and use layer blends and opacity values to create convincing reflections.



- 6** Vegetation. Create a new group and rename it. Drag, drop, scale and position the vegetation in the scene. Colour-correct the vegetation to match the tonal values of the photograph using layer or image adjustments such as Levels, Curves, Photo Filter and Hue/Saturation.



- 7** People. Create a new group and rename it. Drag, drop, scale and position the people in the scene. Colour-correct the people to match the tonal values of the photograph using layer or image adjustments such as Levels, Curves, Photo Filter and Hue/Saturation.



- 8** Shadows of people. To create shadows for a person, duplicate the layer. Using the Hue/Saturation adjustment, create a silhouette from the duplicate layer by setting the Saturation and Lightness values to -100.

Use the Distort function from the Transform tool to manipulate the silhouette to form a shadow. Take care that the shadows lie in the same direction as those in the photograph. Move the Shadow layer beneath the Person layer. Set the opacity of the shadow to match the tonal values of the shadows in the photograph. Use the Gaussian Blur filter to soften the shadow if required.



- 9** Final image.

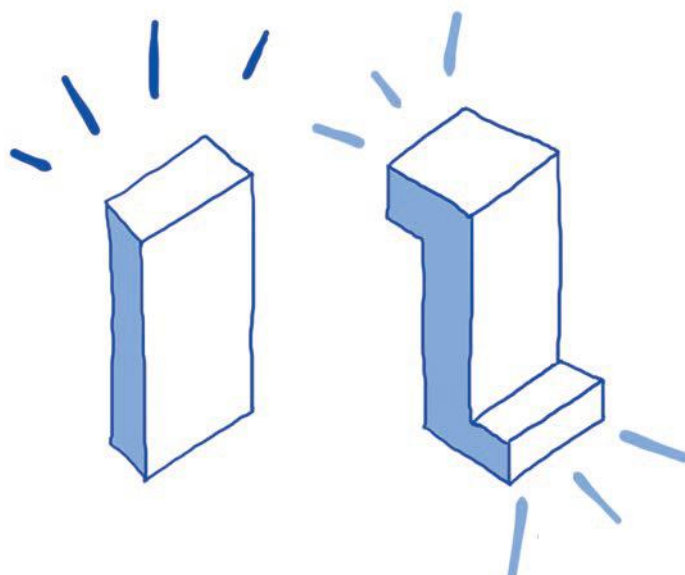
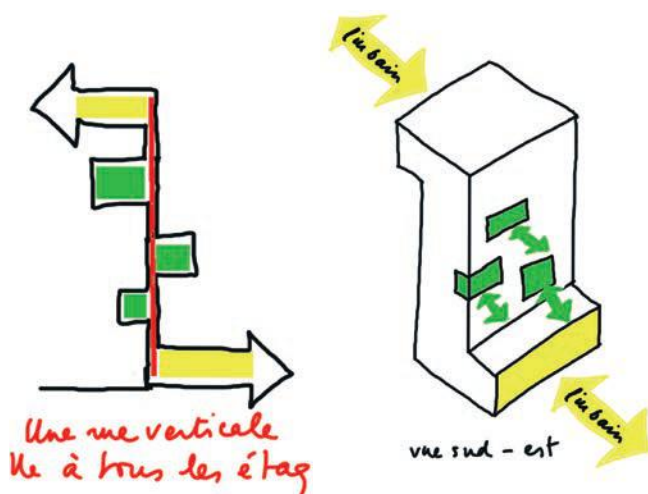


## STEP BY STEP USING PHOTOMONTAGE AS PART OF THE DESIGN PROCESS

These diagrams, drawings and digital models were made as part of the design process for the transformation/renovation of the TSR Tower, Geneva, by Devanthery & Lamunière.



- 1 A photograph and two diagrammatic sketches show the existing tower in context and illustrate the three-dimensional intentions as they look to 'open the form' of the existing tower, 'passing from an "I" volume to a "Z" volume, or from a solitary form to a form that merges more interestingly with the environment'.



2 A computer-generated model.

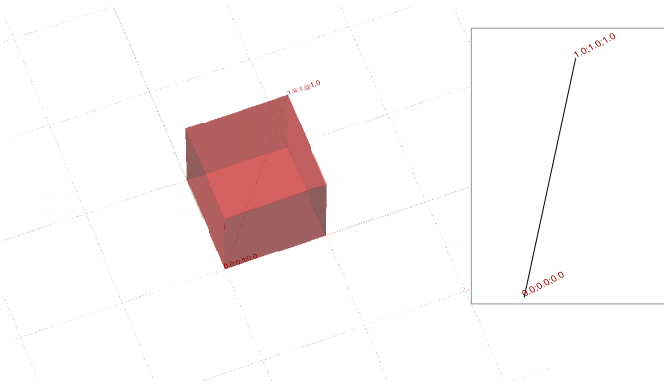


3 The final contextualized rendered model of the proposal.

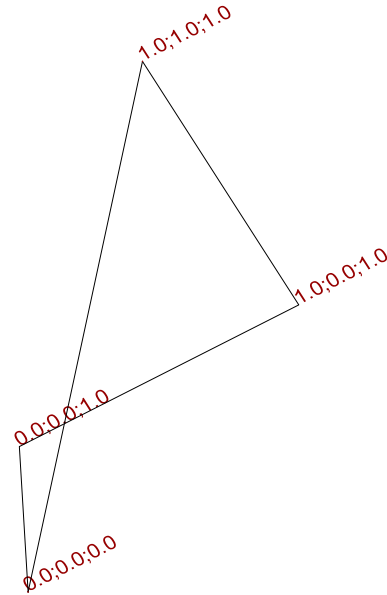


## STEP BY STEP DIGITAL PROCESS

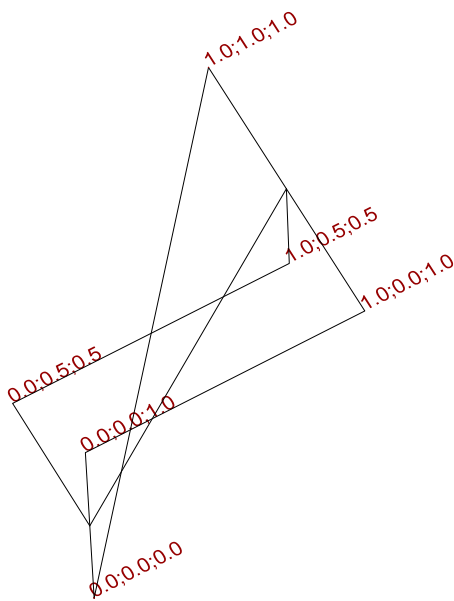
In the following sequence, Yakim Milev brilliantly illustrates how drawing can be produced through scripting in Grasshopper. The drawing technique was particularly suited to his project, which explored the changing nature of temporary rentable space within an existing structure. Grasshopper and other scripting tools are creative devices designed to generate new spatial patterns and organizational strategies. The systems they generate can be tested against other drawings that explore the real conditions of the spatial proposal.



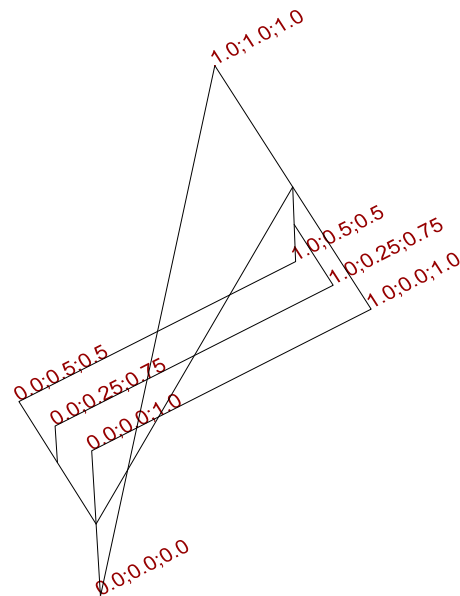
- 1 Take the space diagonal within a box of any size; here it is a box with edges of 1 unit length.



- 2 Move the end points of the space diagonal 1 unit in the Y and Z directions, so that their new positions coincide with the corners of the box. This can be done by either extracting the edges of the bounding box or by switching the Z value in the first point with the Z value of the second point and the Y value of the second point with the Y value of the first point (Decompose Point and Point XYZ operators in Grasshopper).

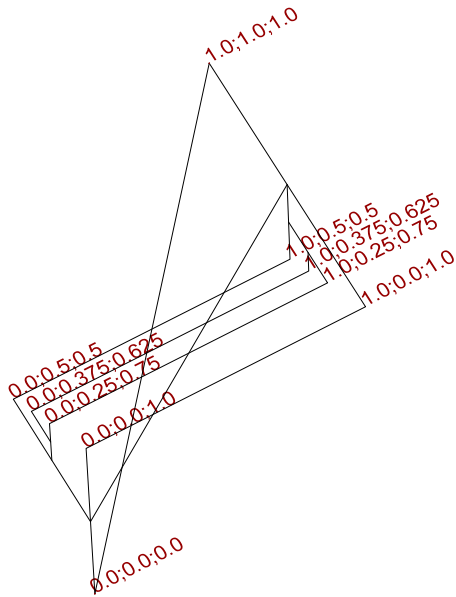


- 3 Move the original points only halfway by dividing the Y and Z values by 2, and create a line that is a space diagonal for a box which has half the thickness of the original box. This time, switch the Y and Z values – instead of Z and Y – of the starting points so you can create the opposite edges of the bounding box.

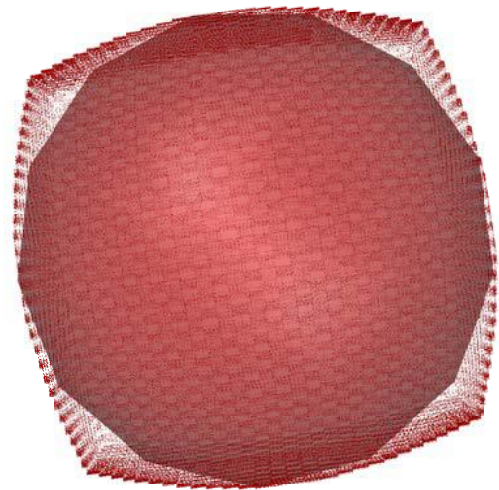


- 4 Repeat the part of the definition used in the second step for the points created in the third.

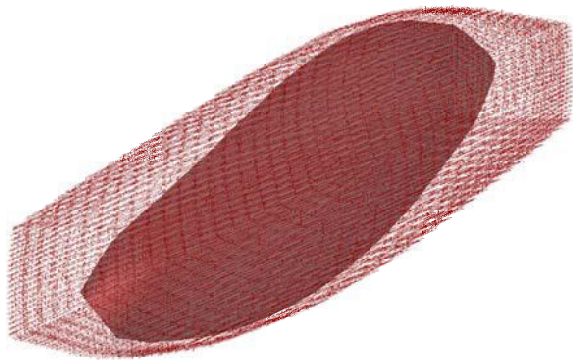




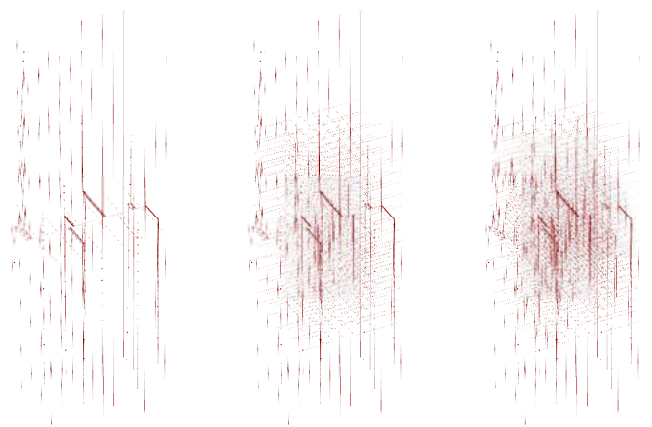
**5** Repeat the part of the definition used in the third step. This creates a recursive process, which fragments the space at a constant rate at every step.



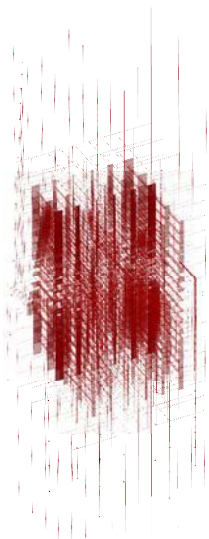
**6** This script can be applied to any form that is defined as lines. To use it, take any form, map any network of lines to it and substitute the space diagonal with the set of lines from the network (this part of the definition is available on the [grasshopper3d.com](http://grasshopper3d.com) website).



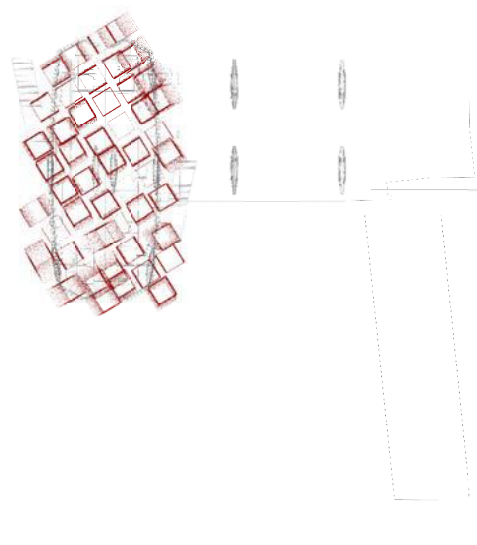
**7** The script adapts automatically to changes in the original form, as in almost all Grasshopper cases.



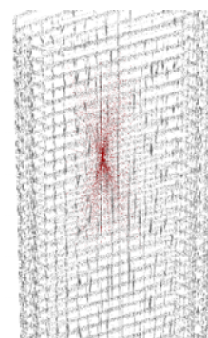
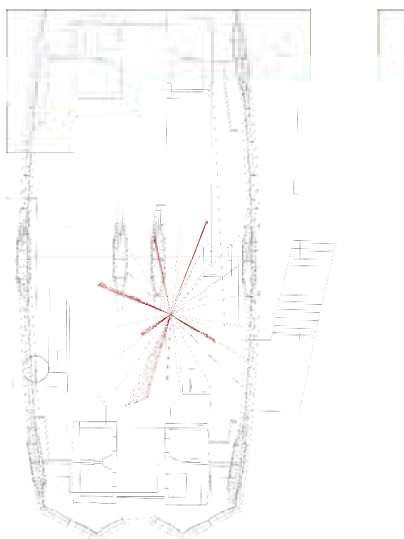
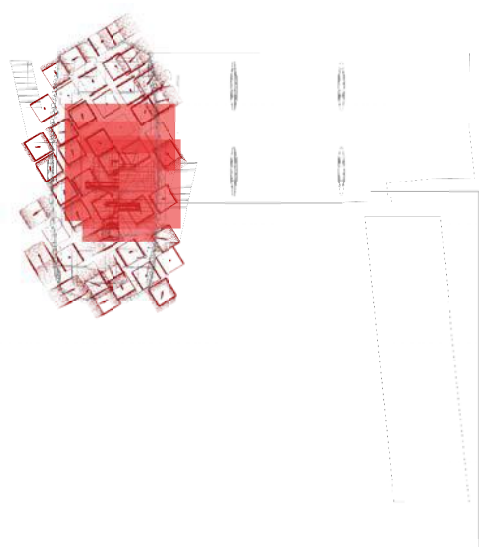
**8** When applied within a three-dimensional grid, the definition creates an alternative organizational system based on the positions of the points of the 3D grid.



9 The bounding box around each individual space diagonal can serve as a source for planes that create the actual enclosures. This is done by exploding the box and selecting the desired face.

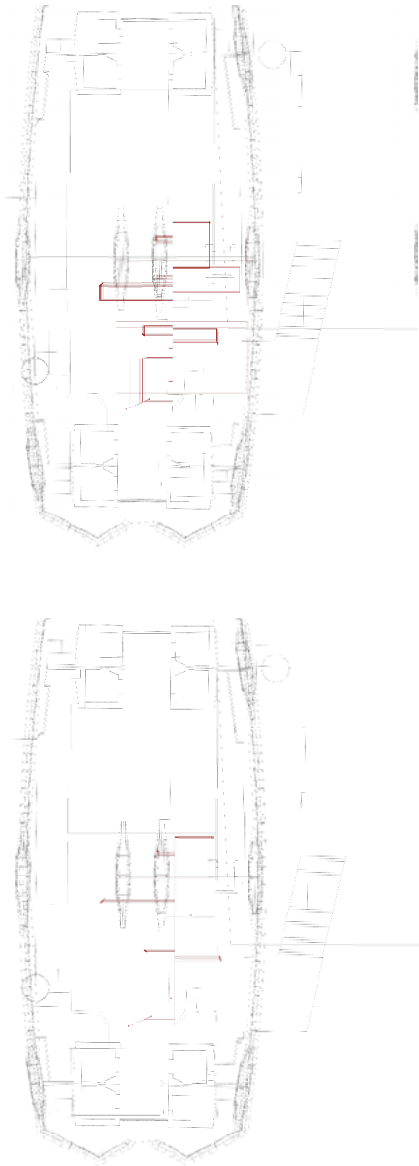


10 In this particular project, a 3D grid derived from various sources of geospatial information was superimposed on the Centre Point tower in London.



11 The project was based on the creation of clusters within the building, so each of the centres of those volumes was connected to all the points on the 3D grid within a given range.

12 Those lines became the base for the analysis and construction of the separate clusters.



**13** The clusters were re-inscribed within the volume of the original building.



**14** The separate clusters were also superimposed on each other, thus creating the final form.



# Glossary

There are some key words relating to drawing that can be interpreted in different ways. It may be useful here to provide a broad definition of the more important terms used in this book.

## Axonometric

Axonometric projection is one of the most frequently used drawing types to create three-dimensional images in architecture. Isometric, dimetric and trimetric projections are types of axonometric drawings and together they form a group of drawing types called parallel projections or 'paraline drawings'. Axonometric is the term used in architecture to describe a projection from a plan drawn to scale: plan elements are projected vertically and to the same scale as the plan, which is first rotated to provide the intended view. Walls that appear at the front of the plan can be omitted or only partially projected to create a 'cutaway' axonometric, which reveals the interior that would otherwise be obscured with uniform projection.

## Collage

Collage techniques can be used in architecture to visualize interiors or exteriors or, most often, to represent a building proposal in a new context. In their simplest form they are cut or torn images or drawings glued onto a surface. More often they are done in Photoshop, using layers to visualize different images in the same plane. A collage can also be used to illustrate a design proposal, perhaps exploring context, light and materiality, but also as a key device in the development of a design.

## Elevation

Elevations are orthogonal drawings, usually parallel to the surface in question (which may be internal or external). Elevations are like vertical sections of a building that illustrate wall articulation frontally. Architects use the term to mean the same as façade. An elevational drawing may be effectively used to define relief using shadows, colour and textures.

## Isometric

Isometric projections are types of axonometric drawings and together with isometric and dimetric drawings form a group of drawing types called parallel projections or 'paraline drawings'. Isometric drawings are formed when the object is turned so that all three axes make the same angle with the picture plane, making the angles between the edges of the building or space 120 degrees. In architectural drawings one axis is usually vertical and the other two are, therefore, at 30 degrees to the horizontal. Most architectural drawings are shown looking down (although details and ceilings may be best shown looking up), and view a plan that appears to be 'opened up' in the direction of viewing

from 90 to 120 degrees. This is advantageous if the drawing reveals an interior, but otherwise is a relatively rigid projection that requires all three visible planes to be emphasized equally.

## Linocut

A linocut is a simple but effective form of relief printing. First the drawing is transferred onto a piece of linoleum (lino). The lino is then carved to take away those areas that are not to appear in the final print. It is then inked with a roller or brush. Even pressure is applied to a piece of paper placed on top of the carved lino (by using a printing press or burnisher), thus transferring the ink onto the paper and creating the print.

## Monoprints

The simplest form of monoprinting, called trace printing, is a useful technique for architects: ink is first spread evenly onto a surface and then a piece of paper with the drawing printed in reverse is laid (face up) onto the ink. By re-applying pressure over the lines of the reversed drawing, that same drawing will be transferred onto the other face of the paper, but the correct way round. This simple process gives a more individual quality to a line drawing.

## Orthogonal

Term used to describe a drawing or projection that is made up of or involves right angles.

## Perspective

The technique of perspective drawing is a representational tool to depict distance, or spatial depth on a two-dimensional plane. Today the persuasive power of mathematical perspective persists: the computer-generated perspective has become the singular most powerful tool to communicate a project. There are two fundamental observations embodied in perspective. First, that objects appear smaller in the distance than they do close up. Second, that objects appear to become foreshortened along the line of sight. Only two kinds of perspective – single-point and two-point perspective – are described in this book, but the number of vanishing points in any perspective will depend on the different orientations of the configuration.

## Photomontage

A collage constructed from photographic images.

## Pigment

Pigment is the substance or powder that, once dissolved in a medium, makes up the colour of paint. The magical character of pigments is their transparency: each pigment varies in

# Further reading

the degree to which it is transparent. The basis of traditional rendering techniques is an understanding that depth of colour is created from layers of transparent glazes, laid one over the other. In architecture we see this most often in watercolours, but raw pigments are flexible and it can be interesting to work with them directly, using other mediums.

## Plan

A plan is a fundamental architectural drawing type. It is a primary organizing device and as a consequence it is the central drawing to a great many projects, and is the drawing through which buildings can be most easily read. Technically a plan may be described as an orthogonal projection from the position of a horizontal plane. The position of this plane and the scale of the drawing can produce a wide variety of plan types, ranging from landscapes to details.

## Scale

The standard metric units used on most architectural drawings are the (SI) units millimetres (mm) and metres (m). In France centimetres (cm) and metres are most often used and in the United States drawings are also done to non-metric scales.

Common metric drawing scales are 1:1 (e.g. full-size fabrication drawings); 1:5 (e.g. construction drawings); 1:20/1:10 (e.g. technical sections); 1:50 (e.g. detail plans or sections); 1:100 (e.g. arrangement plans, sections); 1:200/1:500 (e.g. overall arrangement drawings) and 1:1250/1:2500 (e.g. context drawings).

## Sciagraphy

This is a technique of projecting shadows in drawings and is useful to illustrate surface relief and spatial depth.

## Scripted drawing

Scripted drawings are images that are produced by so-called 'generative software'. These drawings represent formal solutions to complex design parameters, understood mathematically, where the design process can be broken down into an algorithm or set of instructions.

## Section

Like a plan, a section is an orthogonal projection, but from the position of a vertical plane. Sections can be cut anywhere through a building, but tend to be taken where there is a significant spatial condition to describe. Internal elevations will appear between floor plates and an external elevation appears in a section where the vertical plane is taken from outside, or partially outside, of the building.

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*For Francesco*

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